**Supplement 1. Variation in IBV NSP16 extended duplex**

***NSP16* N-terminus duplex (blue and red complementary halves) and**

**Duplex ΔG #**

1 UUAUAAUAUGC**CUGAACUUUAUAAAGUUCAG**AAUUGUGUUAUGG -13.3 209 Chicken

2 UUAUAA**C**AUGC**CUGAACUUUAUAAAGUUCAG**AAUUGUGUUAUGG No -15.2 4

3 UUAUAA**C**AUGC**CUGAACUUUAUAAAGUUCAG**AA**C**UGUGUUAUGG No -15.2 3

4 UUAUAA**C**AUGC**CUGAACUUUAUAAAGUUCAG**A**C**UUGUGUUAUGG No -15.2 1

5 UUAUAAUAUGC**CUGAGCUUUAUAAAGUUCAG**AAUUGUGUUAUGG No -13.3 5

6 UUAUAAUAUGC**CUGAACUUUAUAAAGUUCAG**AA**C**UGUGUUAUGG No -13.3 95

7 UUAUAAUAUGC**CUGAACUUUAUAAAGUUCAGG**A**C**UGUGUUAUGG No -17.0 1

8 UUAUAACAUGC**CUGAACUUUAUAAAGUUCAU**AA**C**UGUGUUAUGG No -11.8 1

9 UUAUAAUAUG**-CUGAACUUUAUAAAGUUCAG**AAUUGUGUUAUGG No -12.7 1

10 UUAUAAUAUGC**CUGAACUUUAUAAAGUUCAG**AAU**C**GUGUUAUGG No -15.5 1

11 UUAUAAUAUGC**CUGAACUUUAUAAAGUUCAG**AAUUGU**A**UUAUGG No -13.3 1

12 UUAUAAUAUGC**CUGAACUUUAUAAGGUUCAG**AAUUGUGUUAUGG No -13.1 2

13 UUAUA**G**UAUGC**CUGAACUUUAUAAAGUUCAG**AAUUGUGUUAUGG No -10.6 1

14 UUA**C**AAUAUGC**CUGAACUUUAUAAAGUUCAG**AAUUGUGUUAUGG Yes -11.0 4

15 UUA**C**AAUAUGC**CUGAACUUUAUAAAGUCCAG**AAUUGUGUUAUGG Yes -6.6 1

16 UUA**C**AAUAUGC**CUGAACUUUACAAAGUCCAG**AAUUGUGUUAUGG Yes -6.6 1

17 UUAUAAUAUGC**CUGAACUUUAUAAAGUUCAG**AAUUGUGUUAU**CU** Yes -11.7 2 Pigeon

18 UUA**C**AAUAUGC**CUGAACUUUAUAAAGUUCAG**AAUUGUGUUAU**CU** Yes -11.0 4 Pigeon

19 UUAUAAUAUGC**CUGAACUUUACAAAGUUCAG**AAUUGUGUUAU**CU** Yes -11.7 1 Chicken

20 UUAUA**U**UAUGC**CUGAACUUUAUAAAGUUCAG**AAUUGUGUUAUGG Yes -10.2 2

21 UUAUAAUAUGC**CCGAACUUUAUAAAGUUCAG**AAUUGUGUUAUGG Yes -8.2 10

22 UUAUAAUAUGC**CUGAACUCUAUAAAGUUCAG**AAUUGUGUUAUGG Yes -12.5 57

23 UUAUAAUAUGC**CUGAACUUUACAAAGUUCAG**AAUUGUGUUAUGG Yes -13.3 14

24 UUAUAAUAUGC**CUGAACUUUAUAAAAUUCAG**AAUUGUGUUAUGG Yes -7.8 1

25 UUAUAAUAUGC**CUGAACUUUAUAAAGUCCAG**AAUUGUGUUAUGG Yes -8.8 30

26 UUAUAAUAUGC**CUGAACUUUAUAAAGUCCAG**AAUUGU**A**UUAUGG Yes -8.8 13

27 UUAUAAUAUGC**CUGAACUUUAUAAAGUCCAG**AAUUG**C**GUUAUGG Yes -7.0 2

28 UUAUAAUAUGC**CUGAACUUUAUAAAGUCCAGU**AUUGUGUUAUGG Yes -8.9 1

29 UUAUAAUAUGC**CCGAACUUUAUAAAGUCCAG**AAUUGUGUUAUGG Yes -4.1 1

30 UUAUAAUAUGC**CUGAACUUUACAAAGUCCAG**AAUUGUGUUAUGG Yes -8.8 3

31 UUAUAAUAUGC**CUGAACUUUACAAAGUUCAG**AA**C**UGUGUUAUGG Yes -13.3 1

32 UUAUAAUAUGC**CUGAACUUUACAAAAUUCAG**AAUUGUGUUAUGG Yes -7.8 2

33 UUAUAAUAUGC**CUGAGCUCUAUAAAGUUCAG**AAUUGUGUUAUGG Yes -6.9 65

34 UUAUAAUAUGC**CUGAGCUUUAUAAAGUCCAG**AAUUGUGUUAUGG Yes -9.1 1

35 UUAUAAUAUGC**CUGAGCUUUAUAAAGUUCAG**AAUUGU**A**UUAUGG Yes -13.3 2

36 UUAUAAUAUGC**CUGAACUCUAUAAAGUCCAG**AAUUGUGUUAUGG Yes -7.4 145

37 UUAUAAUAUGC**CUGAACUCUAUAAAGUCCAG**A**G**UUGUGUUAUGG Yes -9.7 5

38 UUAUAAUAUGC**CUGAACUCUAUAAAGUUCAG**AA**C**UGUGUUAUGG Yes -12.5 6

39 UUAUAAUAUGC**CUGAACUCUACAAAGUUCAG**AAUUGUGUUAUGG Yes -12.5 7

40 UUAUAAUAUGC**CUGAACUUUAUAAAGUACAG**AAUUGUGUUAUGG Yes -8.8 1

41 UUAUAAUAUGC**CUGAACUUUAUAAAGUUCAG**AAUUG**C**GUUAUGG Yes -11.4 2

42 UUAUAAU**U**UGC**CUGAACUUUAUAAAGUUCAG**A**C**UUGUGUUAUGG Yes -10.5 4 Duck

43 UUAUAA**C**AUGC**CUGAACUCUAUAAAGUUCAG**AA**C**UGUGUUAUGG Yes -14.4 8

44 UUAUAA**C**AUGC**CUGAACUUUAUAAAGUCCAG**AA**C**UGUGUUAUGG Yes -10.7 1

45 UUAUAAU**U**UGC**CUGAACUUUAUAAAGUCCAG**A**C**UUGUGUUAUGG Yes -6.1 2 Duck

46 UUAUAAUAUGC**CUGAACUCUAUAAAGUCCAGC**AUUGUGUUAUGG Yes -8.7 1

47 UUA**C**AAUAUGC**CUGAGCUCUAUAAAGUUCAG**AAUUGUGUUAUGG Yes -10.2 1

48 UUAUAAUAUGC**GUGAGCUCUAUAAAGUUCAG**AAUUGUGUUAUGG Yes -10.0 1

49 UUAUAAUA**C**GC**CUGAGCUCUAUAAAGUUCAG**AAUUGUGUUAUGG Yes -14.8 1

50 UUAUAAUAUGC**CUGAACUUUAUAAAGUCCAG**AA**C**UGU**A**UUAUGG Yes -8.8 1

51 UUAU**G**UUAUGC**CUGAACUUUAUAAAGUUCAG**AA**C**UGUGUUAUGG Yes -9.9 1

52 UUAUAA**C**AUGC**CUGAACUAUAUAAAGUUCAG**AAUUG**C**GUUAUGG Yes -11.7 1

53 UUAUAAUAUGC**CUGAGCUCUAUAAAGUUCAG**AAUUG**C**GUUAUGG Yes -10.6 1 Turkey

54 UUAUAAUAUGC**CUGAACUCUAUAAGGUUCAG**AA**C**UGUGUUAUGG Yes -12.6 3 Turkey

55 UUAUAAUAUGC**CUGAACUCUACAAGGUUCAG**AAUUGUGUUAUGG Yes -16.6 1

56 UUAUAAUAUGC**CUGA-CUCUACAAAGUUCAG**AAUUGUGUUAUGG Yes -8.4 1

57 UUA**C**AAUAUGC**CUGAAUUAUAUAAAGUUCAG**AAUUGU**A**UUAUGG Yes -8.5 1

58 UUAUAAU**U**UGC**CUGAACUCUAUAAAGUUCAG**A**C**UUG**C**GUUAUGG Yes -10.2 1 Duck

59 UUAUA**CA**AUGC**CUGAGCUUUAUAAAGUUCAAG**AUUGUGUUAUGG Yes -11.1 2 Goose, Swan

60 UUAUA**CA**AUGC**CUGAGCUCUAUAAAGUUCAAG**AUUGUGUUAUGG Yes -10.3 1 Swan

No mutations relative reference strain (NC\_001451.1)1: **GQ504724.1** (Chicken, Massachusetts/USA, strain Massachusetts, 1941, wild-type); **MK990808.1** (*Gallus gallus*, Australia, 1962; genotype: GI-5); **FJ904720.1** (Chicken, Massachusetts/USA, 1965; genotype: GI-5; McKinley et al., 2011, pathogenic, Liu et al. 2013); **FJ904721.1** (Chicken, Massachusetts/USA, 1972; McKinley et al., 2011); **MK990813.1** (*Gallus gallus*, Australia, 1973, genotype: GI-6); **FJ904722.1** (Chicken, Massachusetts/USA, 1985, strain: Mass41 1979, MCkInley et al., 2011); **FJ904723.1** (Chicken, Massachusetts/USA, 1985, strain: Mass41 1985, McKinnley et al. 2011); **MK982928.1** (*Gallus gallus*, Australia, 1988, genotype: GI-5); **MK990812.1** (*Gallus gallus*, Australia, 1990, genotype: GI-6); **LC716900.1** (*Gallus gallus domesticus*, Japan, 1993); **MN128088.1** (Chicken, Taiwan, 1995, 3rd passage, strain: TW2296/95w [wild-type strain of MN128086.1], Tsai et al., 2020); **MN128086.1** (Chicken, Taiwan, 1995, 79th passage, strain: TW2296/95v [vaccine strain of MN128088.1], Tsai et al., 2020); **MK972912.1** (*Gallus gallus*, Australia, 1999, genotype: GI-6); **MK982928.1** (*Gallus gallus*, Australia, 1999, genotype: GI-5); **MK957244.1** (*Gallus gallus*, Brazil, 2000); **AJ311317.1** (IBV, United Kingdom, 05/15/2001, strain: Beaudette CK); **MK990809.1** (*Gallus gallus*, Australia, 2002, genotype: GI-5); **M94356.1** (IBV, 02/08/2002, strain: Beaudette M42); **EU714029.1** (*Gallus gallus*, China, 11/2002, responsible for chick outbreak of nephritis); **KU556806.1** (*Gallus gallus*, Australia, 02/01/2003, isolate Ck/Aus/NI/03, Quinteros et al., 2016); **AY851295.1** (Chicken, USA/Massachusetts, 12/09/2004, strain: Mass 41); **HM449163.1** (Chicken, China, 12/28/2004, strain: Jin-13, respiratory type); **AY692454.1** (Beaudette-Vero-cell adapted, 07/12/2004); **DQ001338.1** (Vero cell, 04/07/2005, strain: Beaudette, chicken embryo cell passage 3); **DQ001339.1** (Vero cell passage 65, 04/07/2005); **DQ288927.1** (Chicken, China, 10/26/2005, nephrogenic strain); **JF893452.2** (Chicken, China, 2005, isolate YN, nephrogenic strain); **OM525802.1** (Broiler chicken, China, 2005, isolate D532/9/CH/05); **MH181793.1** (Chicken, China, 2006, strain HH06); **KX252779.1** (*Gallus gallus*, China, 2006, strain ck/CH/LLN/06I, multiple organ tropisms); **OM525806.1** (Broiler chicken, Slovakia, 2006, isolate D722/SK/06); **KX219792.1** (*Gallus gallus*, China, 05/2006, islate ck/CH/LGS/06I genotype: LX4, multiorgan tropism); **DQ834384.1** (Chicken, China, 06/30/2006, strain M41, serotype: Massachusetts [vaccine strain]); **KX375805.1** (*Gallus gallus*, China, 2007, isolate ck/CH/LJS/07V, genotype: LX4); **KX252782.1** (*Gallus gallus*, China, 2007, strain ck/CH/LLN/07I, multiporgan tropism); **HM245923.1** (Chicken, China, 2007, isolate DY07); **MK990810.1** (*Gallus gallus*, Australia, 2007, strain Ck/Aus/V1/07, genotype: GV-1); **KX219791** (*Gallus gallus*, China, 02/2007, isolate ck/CH/LHLJ/07I, genotype: LX4, multiorgan tropism, pathogenic, Liu et al. 2013); **KF663560.1** (Chicken, China, 11/2007, isolate ck/CH/IBWF/2007, multiorgan tropism); **KU900738.1** (*Gallus gallus*, South Korea, 2008, strain SNU-8065); **KX364296.1** (*Gallus gallus*, China, 2008, strain ck/CH/LJL/08-9, genotype: LX4); **KX275394.1** (*Gallus gallus*, China, 2008, strain ck/CH/LSD08-8, genotype: LX4); **KX302860.1** (*Gallus gallus*, China, 2008, strain ck/CH/LSD08-7, genotype: LX4); **KX236005.1** (*Gallus gallus*, China, 2008, strain ck/CH/LJL/08-1); **KX252788.1** (*Gallus gallus*, China, 2008, strain ck/CH/LHLJ/08-6, geonotype: LX4); **KM586818.1** (Chicken, China, 08/2008, isoate P100, genotype: QX-type); **FJ807653.1** (Chicken, China, 2008, isolate chicken/JS/YZ07/2008); **KU556807.1** (*Gallus gallus*, Australia, 2008, isolate Ck/Aus/N1/08); **EU637854.1** (Chicken, China, 04/11/2008, strain CK/CH/LSD/05I); **KF853202.1** (Chicken, China, 07/11/2008, isolate SDZB0808, genotype: QX-type); **MN517816.1** (*Gallus gallus*, China, 2009, strain cK/CH/LJL/090608); **KX259249.1** (*Gallus gallus*, China, 2009, isolate ck/CH/LJL/090330, [nephropathogenic strain with varying levels of virulence in specific pathogen-free chickens,](https://www.tandfonline.com/doi/pdf/10.1080/03079457.2010.538037)); **KX259254.1** (*Gallus gallus*, China, 2009, isolate ck/CH/LSD/090314, pathogenic); **KX275392.1** (*Gallus gallus*, China, 2009, isolate ck/CH/LHLJ/110943, genotype LX4, pathogenic); **KX302864.1** (*Gallus gallus*, China, 2009, strain ck/CH/LSD/09091, geotype: LX4, pathogenic); **KX236012.1** (*Gallus gallus*, China, 2009, isolate ck/CH/LSD/091003, pathogenic); **KX252789.1** (*Gallus gallus*, China, 2009, isolate ck/CH/LHLJ/090605, pathogenic); **KX252783.1** (*Gallus gallus*, China, 2009, isolate ck/CH/LHLJ/090510, pathogenic); **KX252784.1** (*Gallus gallus*, China, 2009, isolate ck/CH/LLN/090910, pathogenic); **KX252790.1** (*Gallus gallus*, China, 05/2009, isolate ck/CH/LHLJ/090515, genotype LX4, pathogenic); **KX302869.1** (*Gallus gallus*, China, 08/2009, isolate ck/CH/LHLJ/090806, genotype LX4, pathogenic); **KX236016.1** (*Gallus gallus*, China, 09/2009, isolate ck/CH/LHB/090921, genotype LX4, pathogenic); **JF732903.1** (Chicken, China, 04/2009, isolate Sczy-3, pathogenic); **KF411041.1** (Chicken, China, 11/10/2009, CK/CH/LGX/091109, pathogenic); **KJ425504.1** (*Gallus gallus*, China, 12/05/2009, isolate ck/CH/LHLJ/091205); **KX236006.1** (*Gallus gallus*, China, 2010, isolate ck/CH/LSD/100305); **KU361187.1** (Chicken, China, 2010, isolate CK/CH/2010/JT-1, originated by recombination of various strains, pathogenic); **JF330898.1** (Chicken, China, 2010, isolate ck/CH/LHB/100801); **JX840411.1** (Chicken, China, 10/2010, strain YX10); **OR050557.1** (Layer, South Korea, 12/02/2010, isolate IBV/Korea/415/2010); **KX236011.1** (*Gallus gallus*, China, 09/2012, isolate ck/CH/LSD/091203); **KX364290.1** (*Gallus gallus*, China, 2010, isolate ck/CH/LJL/101150); **KX259248.1** (*Gallus gallus*, China, 2010, isolate ck/CH/LHN/101211); **KX252785.1** (*Gallus gallus*, China, 2010, isolate ck/CH/LSD/100311); **MN531555.1** (*Gallus gallus*, China, 2011, isolate cK/CH/LSD/1112145); **MN509589** (*Gallus gallus*, China, 2011, isolate cK/CH/LHLJ/110664); **KX364292.1** (*Gallus gallus*, China, 2011, isolate ck/CH/LSD/110739, genotype LX4); **KX400753.1** (*Gallus gallus*, China, 2011, isolate ck/CH/LHB/110123, genotype LX4); **MK032181.1** (*Gallus*, China, 2011, isolate gammaCoV/ck/China/I0347/11); **KX236000.1** (*Gallus gallus*, China, 2011, isolate ck/CH/LSD/110912, genotype LX4); **KX247127.1** (*Gallus gallus*, China, 2011, isolate ck/CH/LHB/111190); **KY721498.1** (Chicken, China, 2011); **KC136209.1** (Chicken, China, 2011, isolate ck/CH/LJL/110302); **KU317090.1** (*Gallus gallus*, China, 2011, strain SAIBK2, genotype LX4, nephropathogenic, Wu X et al. 2016); **KU900742.1** (*Gallus gallus*, South Korea, 2011); **KX375806.1** (*Gallus gallus*, China, 2011, isolate ck/CH/LHLJ/110673, genotype LX4, chimeric virus with an LX4-like backbone, except for the S gene, which might be from an unknown strain); **KX375807.1** (*Gallus gallus*, China, 2011, isolate ck/CH/LHLJ/110836, genotype LX4); **KF460437.1** (*Gallus gallus*, Australia, 2011, isolate VicS-v, serotype; sub-group 1); **MT984595.1** (*Gallus gallus*, Romania, 2011); **MT984590.1** (*Gallus gallus*, Hungary, 2011, isolate D1623/1/1/2011/HU); **OR001749.1** (Korean native chicken, South Korea, 07/25/2011, strain IBV/Korea/117/2011); **KX259255.1** (*Gallus gallus*, China, 11/2011, strain ck/CH/LJS/111111, genotype LX4); **KX219793.1** (*Gallus gallus*, China, 11/2011, strain ck/CH/LHB/111168, genotype: LX-4); **OR050546.1** (Broiler, South Korea, 04/11/2011, isolate IBV/Korea/55/2011); **KX219796.1** (*Gallus gallus*, China, 12/2011, strain ck/CH/LXJ/111265, genotype LX4); **MN531554.1** (*Gallus gallus*, China, 2012, strain cK/CH/LLN/120611); **KX372249.1** (*Gallus gallus*, China, 2012, strain ck/CH/LHLJ/121219, genotype LX4); **MT984602.1** (*Gallus gallus*, Romania, 2012, strain D20222/2/3/2012/RO); **MK728875.1** (*Gallus gallus*, United Kingdom, 02/2012, known pathogenic *in vivo* phenotype); **MG448607.1** (*Gallus gallus*, China, 2012, isolate ck/CH/LHB/121042); **KX389094.1** (*Gallus gallus*, China, 2012, strain ck/CH/LBJ/120481, genotype LX4); **KX236013.1** (*Gallus gallus*, China, 2012, strain ck/CH/LSD/120742); **KX236014.1** (*Gallus gallus*, China, 2012, strain ck/CH/LHB/120497); **KF574761.1** (Chicken, China, 2012, isolate SDIB821/2012); **KX219801.1** (*Gallus gallus*, China, 04/2012, strain ck/CH/LSD/120437, genotype LX4); **KX252786.1** (*Gallus gallus*, China, 06/2012, strain ck/CH/LLN/120605, genotype LX4); **KU556804.1** (*Gallus gallus*, Australia, 05/07/2012, isolate Ck/Aus/N1/88, subgenotype 2, pathogenic, isolated from previously vaccinated chickens, Quinteros et al 2016); **KU556805.1** (*Gallus gallus*, Australia, 05/07/2012, islate Armidale A3); **KX259257.1** (*Gallus gallus*, China, 08/2012, strain ck/CH/LJS/120848, genotype LX4); **KF931628.1** (*Gallus gallus*, Australia, 08/06/2012, isolate Vics-del); **KX219798** (*Gallus gallus*, China, 09/2012, isolate ck/CH/LSD/120913); **KX348115.1** (*Gallus gallus*, China, 09/2012, isolate ck/CH/LAH/120907); **KJ128295.1** (Chicken, China, 12/20/2012, isolate CK/CH/SD/121220); **MK972911.1** (*Gallus gallus*, Australia, 2013, isolate Ck/Aus/Q1/13); **MH508703.1** (Chicken, China, 01/01/2013); **KY421673.1** (Chicken, China, 01/01/2013, isolate SD, genotype QX-like, pathogenic); **KX434788.1** (*Gallus gallus*, China, 2013, isolate ck/CH/LHLJ/130622, genotye LX4); **KX372250.1** (*Gallus gallus*, China, 2013, isolate ck/CH/LSD/130205, genotype LX4); **KX302874.1** (*Gallus gallus*, China, 2013, isolate ck/CH/LGS/131148, genotype LX4); **KX302871.1** (*Gallus gallus*, China, 2013, strain ck/CH/LHuB/131123, genotype LX4); **KX302868.1** (*Gallus gallus*, China, 2013, strain ck/CH/LHLJ/130744, genotype LX4); **KX236008.1** (*Gallus gallus*, China, 2013, isolate ck/CH/LDL/130325); **KX252774.1** (*Gallus gallus*, China, 2013, strain ck/CH/LHB/130589); **KX252775.1** (*Gallus gallus*, China, 2013, strain ck/CH/LHB/130628); **KX185057.1** (*Gallus gallus*, China, 2013, strain ck/CH/LHLJ/95I); **KP036505.1** (*Gallus gallus*, China, 2013, strain ck/CH/LJL/130925); **KX219799.1** (*Gallus gallus*, China, 02/2013, strain ck/CH/LSD/130211, genotype LX4); **KX247129.1** (*Gallus gallus*, China, 03/2013 strain ck/CH/LHB/130337, genotype LX4); **KX247128.1** (*Gallus gallus*, China, 05/2013, strain ck/CH/LHB/130569, genotype LX4); **KX219800.1** (*Gallus gallus*, China, 06/2013, strain ck/CH/LSD/130611, genotype LX4); **KY805846.1** (*Gallus gallus*, Egypt, 2014, strain IBV/Ck/EG/CU/4/2014, genotype GI-23 lineage, Abozeid et al. 2017); **KX364294.1** (*Gallus gallus*, China, 2014, strain ck/CH/LBJ/140528, genotype LX4); **KX425847.1** (*Gallus gallus*, China, 2014, strain ck/CH/LJL/140734, genotype LX4); **KX275391.1** (*Gallus gallus*, China, 2014, strain ck/CH/LHLJ/140927); **KX302873.1** (*Gallus gallus*, China, 2014 strain ck/CH/LJL/140924, genotype LX4); **KX185058.1** (*Gallus gallus*, China, 2014, strain ck/CH/LGS/08I); **KP790145.1** (*Gallus gallus*, China, 2014, strain CK/CH/LHLJ/141105); **KP790146.1** (*Gallus gallus*, China, 2014, strain CK/CH/LHLJ/140901); **KX252773.1** (*Gallus gallus*, China, 05/2014, strain ck/CH/LHB/140542, genotype LX4); **KX275390.1** (*Gallus gallus*, China, 11/2014, strain ck/CH/LHLJ/141103, genotype LX4); **KX302875.1** (*Gallus gallus*, China, 11/2014, strain ck/CH/LJL/100512, genotype LX4); **KX302867.1** (*Gallus gallus*, China, 2015, strain ck/CH/LJL/150430, genotype LX4); **ON260867.1** (*Gallus gallus*, China, 02/21/2015, strain CK/CH/SD/MH20 2015, genotype GI-19); **KX219795.1** (*Gallus gallus*, China, 03/2015, strain ck/CH/LSD/150311, genotype LX4); **KY620116.1** (*Gallus gallus*, China, 2016, strain gammaCoV/ck/China/I1101/16, genotype LX4); **MH539771.1** (*Gallus gallus*, Canada, 2015/2016, isolate IBV\_SES\_15AB-01, serotype: Massachusetts, pathogenic, Amarasinghe et al. 2018); **MH539772.1** (*Gallus gallus*, Canada, 2015/2016, isolate IBV\_SES\_15SK-02, similar to MH539772.1 but less pathogenic); **OR050560.1** (Broiler, South Korea, 04/21/2016, isolate IBV/Korea/85/2016); **OR050552.1** (Broiler, South Korea, 04/29/2016, isolate IBV/Korea/87/2016); **OR050563.1** (Broiler, South Korea, 05/07/2016, isolate IBV/Korea/111/2020); **MW222189.1** (Chicken, China, 12/11/2016, isolate GX-NN160421, 3-nt deletion in N gene, low virulence but prolonged virus shedding, Lv Di et al 2021); **LC710779.1** (*Gallus gallus*, Germany, 2016, isolate Beaudette-FUB, genetic engineering constructs); **OR050545.1** (Broiler, South Korea, 04/12/2017, isolate IBV/Korea/37/2017); **OR050550.1** (Broiler, South Korea, 05/23/2017, isolate IBV/Korea/76/2017); **MK329221.1** (Chicken, Taiwan, 07/05/2017, isolate CK-CH-GX-YL17, genotype TC07-2); **MK309398.1** (Chicken, China, 07/05/2017, isolate CK/CH/GD/HY16, genotype TC07-2); **MH020185.1** (Chicken, China, 10/18/2017, isolate CK/CH/HD/171018, genotype QX-like); **MK032177.1** (*Gallus*, China, 2017, isolate gammaCoV/ck/China/I0724/17); **MK032178.1** (*Gallus*, China, 2017, isolate gammaCoV/ck/China/I0718/17); **MK032179.1** (*Gallus*, China, 2017, isolate gammaCoV/ck/China/I0722/17); **MK032180.1** (*Gallus*, China, 2017, strain gammaCoV/ck/China/I0737/17); **KY799582.1** (*Gallus gallus*, China, 03/20/2017, strain ck/CH/LSC/99I, pathogenic, Jian L et al 2018); **MN199463.1** (*Gallus gallus*, South Korea, 04/05/2017, isolate R17/19); **MN199464.1** (*Gallus gallus*, South Korea, 05/04/2017, isolate R17/27); **MN199465.1** (*Gallus gallus*, South Korea, 05/19/2017, isolate R17/36); **MK423876.1** (Pheasant, China, 2017); **MK423877.1** (Pheasant, China, 2017); **MK644086.1** (Chicken, China, 2018, E160\_YN, genotype GI-22, attenuated, suggested secondary to S and 5a, Zhao Y et al 2019); **OP868815.1** (Chicken, China, 2018, isolate China/Sichuan/QX-like/SczyC30/2020, genotype QX); **OR050543.1** (Broiler, South Korea, 02/08/2018, isolate IBV/Korea/17/2018); **MW896950.1** (Chicken, China, 04/01/2018, isolate s23-194345); **MN199466.1** (*Gallus gallus*, South Korea, 04/17/2018 isolate R18/23); **MW351625.1** (Chicken, China, 2019, isolate IBV-rSD-H238A); **MW351623.1** (Chicken, China, 2019, isolate IBV-rSD, genotype GX-like); **MW351624.1** (Chicken, China, 2019, isolate IBV-rSD-H223A, genotype QX-like, endoU deficient mutant); **MW351626.1** (Chicken, China, 2019, isolate IBV-rSD-K278A, engineered endoribonuclease deficient mutant); **MW351628.1** (Chicken, China, 2019, islate IBV-rSD-Y334A, endoU deficient mutant); **MW351629.1** (Chicken, China, 2019, islate IBV-rSD-H223A/H238A/K278A/Y334A, endoU deficient mutant); **MW815494.1** (Avian, China, 04/2019, isolate CK/CH/TJ1904); **ON310377.1** (*Gallus gallus*, China, 05/2019, isolate CH/LN/2019, genotype QX-like); **MK937830.1** (*Gallus*, China, 05/15/2019, isolate M41); **MN894506.1** (*Gallus gallus*, China, 07/16/2019, isolate CK/CH/HD/190716, genotype QX-like); **OM525799.1** (Layer chicken, Ohio, United States, 2020, isolate DMV25/OH/20, da Silva et al. 2022); **OM525800.1** (Layer chicken, Ohio, United States, 2020, isolate DMV26/OH/20, da Silva et al. 2022); **OM525801.1** (Layer chicken, Ohio, United States, 2020, isolate DMV28/OH/20, da Silva et al. 2022); **MW222181.1** (*Gallus gallus*, China, 2020, isolate IBV/M41/Y191); **MW419300.1** (*Gallus gallus*, China, 2020, strain IBV/M41/Y83); **MW248465.1** (*Gallus gallus*, China, 2020, isolate IBV/M41/Y82); **MW429059.1** (*Gallus gallus*, China, 2020, isolate IBV/M41/Y164); **MW429060.1** (*Gallus gallus*, China, 2020, isolate IBV/M41/Y195); **MW429062.1** (*Gallus gallus*, China, 2020, isolate IBV/M41/N56); **MW791835.1** (Chicken, China, 2020, isolate CK/CH/FJ/202005, genotype VI, 10 day old SPF chicken embryo); **MT460496.1** (Chicken, China, 05/03/2020, isolate CK/CH/LAH/1806); **MW436705.1** (*Gallus gallus*, China, 2020, isolate IBV/M41/Y25); **MW446887.1** (*Gallus gallus*, China, 2020, isolate IBV/M41/Y192); **MW446888.1** (*Gallus gallus*, China, 2020, isolate IBV/M41/Y27); **MW792511.1** (*Gallus gallus*, China, 2020, strain I0302/20); **MW792514.1** (*Gallus gallus*, China, 2020, strain I0303/20); **MZ368698.1** (*Gallus gallus*, Brazil, 07/17/2020, strain Beaudette, genotype GI-1); **OP737825.1** (Chicken, China, 04/20/2021, isolate IBV/chicken/Jiangsu/J1231/2021, pathogenic); **OP737826.1** (Chicken, China, 04/20/2021, isolate IBV/chicken/Jiangsu/J1237/2021, pathogenic); **MW847253.1** (*Gallus gallus*, Germany, 03/31/2021, artificial chromosome with Beaudette strain); **ON951674.1** (Chicken, China, 11/18/2021, strain CK/CH/SX/MJ4); **ON951675.1** (Chicken, China, 11/18/2021, strain CK/CH/SX/MJ5); **ON951676.1** (Chicken, China, 11/18/2021, strain CK/CH/SX/MJ9); **OQ716703.1** (*Gallus gallus*, Indonesia, 12/01/2021, isolate IBV/ID761/2021, genotype QX-like); **OM912707.1** (Chicken, USA, 03/02/2022, isolate IBV/ck/MEX/2960/21); **OQ716701.1** (*Gallus gallus*, Indonesia, 06/03/2022, isolate IBV/ID865/2022, genotype QX-like).

One mutation (U to C at position 19,532 of reference strain NC\_001451.1, without effect on extended duplex)2: **KX258195.1** (*Gallus gallus*, Brazil, 2013, chicken embryonated eggs 3rd passage); **MG913342.1** (*Gallus gallus*, Brazil, 2013, isolate AvCoV/Gallus gallus/Brazil/sample 38/2013 GI-11, 3rd passage in chicken embryos); **ON41989.1** (*Gallus gallus*, Argentina, 2013); **KY626044.1** (*Gallus gallus*, Brazil, 2016, strain BR-I, genotype: GI-11)

Two mutations (U to C at positions 19,532 and 19,559 of reference strain NC\_001451.1, without effect on extended duplex)3: **MK990811.1** (*Gallus gallus*, Australia, 1971, Ck/Aus/V1/71, genotype: GI-6); **MT701511.1** (*Gallus gallus*, China, 09/2017, isolate GD17/04, genotype: 4/91 [GI-13]); **OP737824.1** (Chicken, China, 05/11/2021, IBV/chicken/Henan/H1036/2021)

Two mutations (U to C at positions 19,532 and 19,558 of reference strain NC\_001451.1, without effect on extended duplex)4: **MK953937.1** (*Gallus gallus*, Brazil, 2014, strain Brazil/SP55)

One mutation (A to G at position 19,541 of reference strain NC\_001451.1, without effect on extended duplex)5: **FN430415.1** (IBV, Nigeria, 2006, isolate NGA/A116E7/2006 pathogenic, Ducatez et al. 2009); **MZ325296.1** (*Gallus gallus*, Cameroon, 2013, strain D2326/3/13/CM); **MZ325297.1** (*Gallus gallus*, Cameroon, 2013, strain D2326/4/13/CM); **MK217373.1** (*Gallus*, China, 2017, strain I0725/17); **MW729513.1** (*Gallus*, China, 2020)

One mutation (U to C at position 19,559 of reference strain NC\_001451.1, without effect on extended duplex)6: **HM245924.1** (Chicken, China, 2004, isolate CQ04-1, pathogenic); **MK581205.1** (*Gallus gallus*, Poland, 10/23/2004, strain gammaCoV/Ck/Poland/548/2004); **OM525803.1** (Layer chicken, France, 2005, isolate D535/4/FR/05, da Silva et al. 2022); **OM525804.1** (Chicken, Greece, 2005, isolate D591/2/GR/05, da Silva et al. 2022); **FN430414.1** (IBV, USA, 2005, isolate ITA/90254/2005); **OM525805.1** (Chicken, Hungary, 2006, isolate D683/HU/06, da Silva et al. 2022); **KX364303.1** (*Gallus gallus*, China, 2007); **HO850618.1** (*Gallus gallus*, China, 08/25/2007); **MN509587.1** (*Gallus gallus*, United Kingdom, 01/2009, strain cK/CH/LDL/091021); **KX302863.1** (*Gallus gallus*, China, 2009); **KT886454.1** (*Gallus gallus*, Poland, 2009); **KP118894.1** (*Gallus gallus*, China, 2009); **KX259251.1** (*Gallus gallus*, China, 2010); **KX302872.1 9** (*Gallus gallus*, China, 2010); **MT984583** (*Gallus gallus*, Hungary, 2010); **JQ088078.1** (Chicken, Sweden, 2010); **KF663561.1** (Chicken, China, 04/2011); **KX259252.1** (*Gallus gallus*, China, 2011); **KX434790.1** (*Gallus gallus*, China, 2011); KX640829.1 (*Gallus gallus*, China, 2011); **MN531556.1** (*Gallus gallus*, China, 2011); **KX364300.1** (*Gallus gallus*, China, 2011); **KP868572.1** (*Gallus gallus*, China, 2011); **MN548289.1** (*Gallus gallus*, United Kingdom, 01/2011); **MT984589.1** (*Gallus gallus*, Ukraine, 2011); **MT984591.1** (*Gallus gallus*, Romania, 2011); **MT984598.1** (*Gallus gallus*, Belarus, 2011); **KY421672.1** (Chicken, China, 2012); **MT984597.1** (*Gallus gallus*, Romania, 2012); **MT984598.1** (*Gallus gallus*, Portugal, 2012); **KF663559.1** (Chicken, China, 06/2012); **KC013541.1** (Chicken, China, 07/12/2012); **KC119407.1** (Chicken, China, 07/20/2012); **MT984599.1** (*Gallus gallus*, Greece, 2013); **KX302861.1** (*Gallus gallus*, China, 2013); **KX302865.1** (*Gallus gallus*, China, 2013); **OQ117368.1** (Chicken, China, 2013); **KY407556.1** (*Gallus gallus*, China, 2014); **KU361188.1** (Chicken, China, 2014); **KP790143.1** (*Gallus gallus*, China, 2014); **KP790144.1** (*Gallus gallus*, China, 2014); **KT946798.1** (Chicken, China, 01/01/2014); **KX364295.1** (*Gallus gallus*, China, 05/ 2014); **MG738154.1** (*Gallus gallus*, Malaysia, 2014); **MG738155** (*Gallus gallus*, Malaysia, 2015); **MG233398.1** (Chicken, Iran, 2015); **MH924835.1** (*Gallus*, China, 2016); **MT591566.1** (Chicken, Germany, 02/2016); **MG517474.1** (Chicken, China, 07/01/2016); **MG197727.1** (Chicken, China, 11/01/2016); **MN307884.1** (Yellow feather broiler, China, 2017); **MN217372.1** (*Gallus*, China, 2017); **KY933089.1** (Chicken, United Kingdom, 04/12/2017); **KY933090.1** (Chicken, United Kingdom, 04/12/2017); **MW896952.1** (Chicken, China, 04/01/2018); **ON260866.1** (*Gallus gallus*, China, 08/13/2018); **OR978261.1** (Chicken, Viet Nam, 2019); **OQ725698.1** (*Gallus gallus*, Tanzania, 05/03/2019); **MT978193.1** (*Gallus*, China, 2020); **MZ456995.1** (Chicken, China, 05/12/2020); **OK423447.1** (*Gallus sp.*, China, 2021); **OR840944.1** (Chicken, Viet Nam, 2021); **OM937935.1** (*Gallus*, China, 2022); **OM937936.1** (*Gallus*, China, 2022); **OM937937.1** (*Gallus*, China, 2022); **OM937938.1** (*Gallus*, China, 2022); **OM937939.1** (*Gallus*, China, 2022); OM937940.1 (*Gallus*, China, 2022); **OM937941.1** (*Gallus*, China, 2022); **OM937942.1** (*Gallus*, China, 2022); **OM937943.1** (*Gallus*, China, 2022); **OM937944.1** (*Gallus*, China, 2022); **OM953425.1** (*Gallus*, China, 2022); **OM988131.1** (*Gallus sp.*, China, 2022); **OM988132.1** (*Gallus sp.*, China, 2022); **OM988133.1** (*Gallus sp.*, China, 2022); **OM988135.1** (*Gallus sp.*, China, 2022); **OM988136.1** (*Gallus sp.*, China, 2022); **OM988137.1** (*Gallus sp.*, China, 2022); **OM988139.1** (*Gallus sp.*, China, 2022); **OM988140.1** (*Gallus sp.*, China, 2022); **OM988141.1** (*Gallus sp.*, China, 2022); **OM988142.1** (*Gallus sp.*, China, 2022); **OM988143.1** (*Gallus sp.*, China, 2022); **OM988144.1** (*Gallus sp.*, China, 2022); **OM988145.1** (*Gallus sp.*, China, 2022); **OM988147.1** (*Gallus sp.*, China, 2022); **OM988149.1** (*Gallus sp.*, China, 2022); **OM988151.1** (*Gallus sp.*, China, 2022); **OM988154.1** (*Gallus sp.*, China, 2022); **OM988155.1** (*Gallus sp.*, China, 2022); **OM988157.1** (*Gallus sp.*, China, 2022); **OM988158.1** (*Gallus sp.*, China, 2022); **ON951677.1** (Chicken, China, 11/18/2021); **OR208629.1** (Mallard, China, 06/2022)

Two mutations (A to G and U to C at positions 19,557 and 19,559, respectively of reference strain NC\_001451.1, without effect on extended duplex)7: **OR791595.1** (*Gallus Gallus*, Netherlands, 2019, gCoV/ck/Netherlands/D2860//2019, genotype: GVIII)

Two mutations (U to C at positions 19,532 and 19,559, respectively, of reference strain NC\_001451.1, without effect on extended duplex)8: **KX252791.1** (Gallus gallus, China, 1998, cK/CH/LLN/98I, genotype: LX4)

One deletion at position 19,536 of reference strain NC\_001451.1, without effect on extended duplex)9: **KX348117.1** (*Gallus gallus*, China, 07/2012)

One mutation (U to C at position 19,560 of reference strain NC\_001451.1, without effect on extended duplex)10: **EU022526.1** (Turkey, Indiana/USA, 07/08/2007, isolate TCoV-ATCC, embryonated turkey eggs [day 21])

One mutation (G to A at position 19,563 of reference strain NC\_001451.1, without effect on extended duplex)11: **KX077987.1** (*Gallus gallus*, China, 2015, strain ck/CH/LDL/150434-III).

One mutation (A to G at position 19,550 of reference strain NC\_001451.1, without effect on extended duplex)12: **MT984584** (Gallus gallus, Hungary, 2011, strain 211776/Imrehegy/2011/HU, Bali et al. 2021); **MT984600.1** (*Gallus gallus*, Poland, 2013, strain D2353/2013/PL, Bali et al. 2021).

One mutation (A to G at position 19,531 of reference strain NC\_001451.1, without effect on extended duplex)13: **MW729512.1** (*Gallus*, China, 2020).

One mutation (U to C at position 19,529 of reference strain NC\_001451.1, introducing mismatch in extended duplex)14: **LC716901.1** (*Gallus gallus domesticus*, Japan, 1998, strain JP/Shimane/98); **MN025323.1** (Pigeon, China, 12/01/2018, pigeon CoV dominant in China); **LC663496.1** (*Gallus gallus*, Japan, 12/03/2021, strain C-78E128, attenuated strain obtained by 128 egg-passages); **LC683780.1** (*Gallus gallus domesticus*, Japan, 02/10/2022, strain JP/Yamagata/2017).

Two mutations (U to C at positions 19,529 and 19,553 of reference strain NC\_001451.1, introducing mismatches in extended duplex)15: **JQ977697.1** (*Gallus gallus*, South Korea, 2008, isolate SNU8067)

Three mutations (U to C at positions 19,529, 19547 and 19,553 of reference strain NC\_001451.1, introducing mismatches in extended duplex)16: **KX266757.1** (*Gallus gallus*, Taiwan, 2008, isolate 3575/08, strong respiratory and renal pathogenicity, delayed expression of a subset of early innate immune genes, Lin S-Y et al. 2016, isolated from broilers vaccinated with the attenuated viral vaccine derived from a Taiwan strain 2575/98)

Two mutations at the end (CU instead of GG introducing two mismatches in extended duplex) relative reference strain (NC\_001451.1)17: **KT254299.1** (Pigeon, China, 2014, strain PdCoV/PG/Guangdong/1507/2014, pigeon-dominant CoV); **MN025324** (Pigeon, China, 12/01/2018, isolate PdCoV/PG/Hebei/15-4-6/2018, pigeon-dominant CoV).

Three mutations (CU instead of GG at the end and U to C at position 19,529 of reference strain NC\_001451.1, introducing two mismatches in extended duplex) relative reference strain (NC\_001451.1)18: **KT254297.1** (Pigeon, China, 2014, isolate PdCoV/PG/Guangdong/1418/2014, pigeon-dominant CoV); **KT254298.1** (Pigeon, China, 2014, isolate PdCoV/PG/Guangdong/1068/2014, pigeon-dominant CoV); **MN025321.1** (Pigeon, China 12/01/2018, isolate PdCoV/PG/Jiangsu/9-1-3/2018, pigeon-dominant CoV); **MN025322.1** (Pigeon, China 12/01/2018, isolate PdCoV/PG/Jiangsu/9-4-6/2018, pigeon-dominant CoV); **MN025323.1** (Pigeon, China 12/01/2018, isolate PdCoV/PG/Jiangsu/9-7-9/2018, pigeon-dominant CoV)

Three mutations (CU instead of GG at the end and U to C at position 19,547 of reference strain NC\_001451.1, introducing two mismatches in extended duplex) relative reference strain (NC\_001451.1)19: **OP899613.1** (Indigenous chicken, Kenya, 01/31/2017, isolate AvCoV/ck/KE/1922/A376/2017).

One mutation (A to U at position 19,531 of reference strain NC\_001451.1, introducing mismatch in extended duplex)20: **MK574042.1** (*Gallus gallus*, China, 2011, isolate ck/CH/LHB/110615); **MK574043.1** (*Gallus gallus*, China, 2011, isolate ck/CH/LHB/110617).

One mutation (U to C at position 19,538 of reference strain NC\_001451.1, introducing mismatch in duplex portion with sense = antisense)21: **KC008600.1** (Chicken, China, 1985); KX252777.1 (*Gallus gallus*, China, 2007); **MN548286.1** (*Gallus gallus*, United Kingdom, 01/2011); **KY407557.1** (*Gallus gallus*, China, 2014); **KY407558.1** (*Gallus gallus*, China, 2014); **MN197549.1** (Chicken, China, 2016); **MK217374.1** (*Gallus*, China 2016); **MK217375.1** (*Gallus*, China 2016); **MF882923.1** (Chicken, China, 07/2016); **MW815495.1** (Avian, China, 11/03/2020)

One mutation (U to C at position 19,544 of reference strain NC\_001451.1, introducing mismatch in duplex portion with sense=antisense)22: **MN128087.1** (Chicken, Taiwan, 1998, strain TW2575/98vac, 77th passage, group TW-I [live attenuated vaccine strain]); **KX219797.1** (*Gallus gallus*, China, 01/2002); **KX236001.1** (*Gallus gallus*, China, 2003); **KX252772.1** (*Gallus gallus*, China, 2003); **KX252787.1** (*Gallus gallus*, China, 2003); **KX302866.1** (*Gallus gallus*, China, 2004); **AY646283.1** (IBV, China, 06/05/2004); **KF280267.1** (Chicken, China, 07/12/2004); **KX252778.1** (*Gallus gallus*, China, 2005); **HO848267.1** (*Gallus gallus*, China, 08/05/2005); **DQ646405.1** (IBV, Taiwan, submitted 07/28/2008, isolate TW257598, wild type of MN128087.1); **MF924724.1** (*Gallus gallus*, South Korea, 12/11/2008); **MF924725.1** (*Gallus gallus*, South Korea, 12/11/2008); **KX252780.1** (*Gallus gallus*, China, 2009); **KF6688605.1** (*Gallus gallus*, China, 2009); **KX236007.1** (*Gallus gallus*, China, 2010); **KX236010.1** (*Gallus gallus*, China 04/2010); **KP118886.1** (*Gallus gallus*, China, 2011); **KX236002.1** (*Gallus gallus*, China, 2011); **KX236003.1** (*Gallus gallus*, China, 2011); **KX247130** (*Gallus gallus*, China, 04/2012); **KX259256.1** (*Gallus gallus*, China, 05/2012); **MT556742.1** (Chicken, USA, 11/2012); **MN987231.1** (Chicken, Egypt, 11/2012); **KX252776.1** (*Gallus gallus*, China, 2013); **KX302870.1** (*Gallus gallus*, China, 2013); **KP343681.1** (*Gallus gallus*, China, 2013); **KF280268.1** (Chicken, China, 06/22/2013); **KF280269.1** (Chicken, China, 06/22/2013); **KF280270.1** (Chicken, China, 06/22/2013); **KX275393.1** (*Gallus gallus*, China, 07/2013); **KX364297.1** (*Gallus gallus*, China, 10/2013); **KX348116.1** (*Gallus gallus*, China, 05/2014); **KX236015.1** (*Gallus gallus*, China, 07/2014); **KU356856.1** (Chicken, China, 09/2014); **KX434789.1** (*Gallus gallus*, China, 2014); **KT852992.1** (*Gallus gallus*, China, 2015, strain: tl/CH/LDt3/03, attenuated); **KX236004.1** (*Gallus gallus*, China, 2015); **KR608272.1** (*Gallus gallus*, China, 05/06/2015); **KX252781.1** (*Gallus gallus*, China, 06/2015); **MN599049.1** (Broiler, US, 07/31/2015); **MT505388.1** (Avian, China, 03/15/2016); **MN987230.1** (Chicken, Egypt, 04/2016); **MN262644.1** (Chicken, Egypt, 2018); **MW896951** (Chicken, China, 04/01/2018); **OK507216.1** (*Gallus gallus*, China, 2020); **OM970248.1** (Chicken, China, 2021, strain CK/CH/GX/202109); **OK423446.1** (*Gallus sp.*, China, 2021); **OQ729967.1** (*Gallus gallus*, Indonesia, 06/06/2021); **OQ729966.1** (*Gallus gallus*, Indonesia, 08/07/2021); **OP823402.1** (IBV, USA, 10/26/2021); **OQ716704.1** (*Gallus gallus*, Indonesia, 11/10/2021); **OP381188.1** (*Gallus gallus*, USA, 10/01/2021); **OQ095389.1** (IBV, USA, 03/03/2022); **OQ716702.1** (*Gallus gallus*, Indonesia, 03/08/2022); **ON036184.1** (*Gallus gallus*, China, 03/18/2022); **ON036185.1** (*Gallus gallus*, China, 03/18/2022)

One mutation (U to C at position 19,547 of reference strain NC\_001451.1, introducing mismatch in duplex portion with sense=antisense)23: **MK581203.1** (*Gallus gallus*, Poland, 07/1997); **NC\_048213.1** (Chicken, India, 2003); **JF699752.1** (Duck, China, 05/2004); JF705860.1 (Duck, China, 05/2004); **JF274479.2** (Chicken, China, 05/07/2007); **EU817497.1** (Chicken, China, 2008); **JF828980.1** (Chicken, China, 2010); **KJ435286.1** (*Gallus gallus*, China, 12/27/2011); **KC013541.1** (Chicken, China, 07/12/2012); **MK937832.1** (*Gallus gallus*, China, 2013); **AY641576.1** (IBV, China, 05/31/2004); **MK937828.1** (*Gallus gallus*, China, 2016); **OP899612.1** (*Gallus domesticus*, Kenya, 01/31/2017); **OM912698.1** (IBV, Mexico, 04/23/2019)

One mutation (G to A at position 19,551 of reference strain NC\_001451.1, introducing mismatch in duplex portion with sense=antisense)24: **LC634083.1** (*Gallus gallus domesticus*, Japan, 05/28/2021)

One mutation (U to C at position 19,553 of reference strain NC\_001451.1, introducing mismatch in duplex portion with sense=antisense)25: **GU393336.1** (*Gallus gallus*, USA, 1954); **GU393337.1** (*Gallus gallus*, USA, 1956); **GU393334.1** (*Gallus gallus*, USA, 1960); **GU393338.1** (*Gallus gallus*, USA, 1964); **MK957245.1** (*Gallus gallus*, Brazil, 1988); **JQ977698.1** (*Gallus gallus*, South Korea, 1991); **GQ427175.1** (Turkey, USA, 1994); **MG021194.1** (Chicken, Italy, 1996); **ON419876.1** (*Gallus gallus*, Argentina, 2011); **KU900739.1** (*Gallus gallus*, South Korea, 2003); **KU900740.1** (*Gallus gallus*, South Korea, 2005); **OR268739.1** (*Gallus gallus*, Mexico, 2007); **OR268740.1** (*Gallus gallus*, Mexico, 2007); **OR268741.1** (*Gallus gallus*, Mexico, 2007); **OR268750.1** (*Gallus gallus*, Mexico, 2007); **NC\_010800.1** (Turkey, Canada, 08/14/2007); **KU900741.1** (*Gallus gallus*, South Korea, 2009); **MT984585.1** (*Gallus gallus*, Greece, 2010); **KU900743.1** (*Gallus gallus*, South Korea, 2010); **OR050562.1** (Broiler, South Korea, 07/25/2010); **OR050558.1** (IBV, South Korea, 12/10/2010); **MF421320.1** (*Gallus gallus*, Uruguay, 2011); **ON419878.1** (*Gallus gallus*, Uruguay, 2012); **MK618758.1** (Chicken, South Korea, 2012); **ON419877.1** (*Gallus gallus*, Uruguay, 2014); **OR050562.1** (IBV, South Korea, 04/22/2016); **OR050561.1** (Broiler, South Korea, 05/03/2016); **MT984601.1** (*Gallus gallus*, Romania, 2017); **MN199462.1** (*Gallus gallus*, South Korea, 04/05/2017); **OR050554.1** (Broiler, South Korea, 01/30/2019)

Two mutations (U to C and G to A at positions 19,553 and 19,563, respectively, of reference strain NC\_001451.1, introducing mismatches in extended duplex)26: OR268745.1 (*Gallus gallus*, Mexico, 2019, isolate Mex-1); OR268752.1 (*Gallus gallus*, Mexico, 2019, isolate Mex-3009); OR268742.1 (*Gallus gallus*, Mexico, 2019, isolate Mex-20); OR268752.1 (*Gallus gallus*, Mexico, 2020, isolate Mex-12); OR268749.1 (*Gallus gallus*, Mexico, 2020, isolate Mex-14P); OM912677.1 (*Gallus gallus domesticus*, Mexico/South, 11/25/2020, IBV/ck/MEX/2360/20, serotype: GI-9 [Arkansas type]); OM912678.1 (*Gallus gallus domesticus*, Mexico/South, 11/25/2020, IBV/ck/MEX/2359/20, serotype: GI-9 [Arkansas type]); OM912695.1 (*Gallus gallus domesticus* [Broiler], Mexico/Central, 01/28/2021, IBV/ck/MEX/2523/21, serotype: GI-13 [793B or 4/91-like], [vaccine strain]); OM912694 (*Gallus gallus domesticus*, Mexico/Central, 02/25/2021, IBV/ck/MEX/2562/21, serotype: GI-9 [Arkansas type]); OM912694 (*Gallus gallus domesticus*, Mexico/Central, 02/25/2021, IBV/ck/MEX/2563/21, serotype: GI-9 [Arkansas type]); OM912688.1 (*Gallus gallus domesticus*, Mexico/North, 07/11/2021, IBV/ck/MEX/2742/21, serotype: GI-9 [Arkansas type]); OM912704.1 (*Gallus gallus domesticus*, Mexico/Central, 11/23/2021, IBV/ck/MEX/2930/21, serotype: GI-9 [Arkansas type]); OM912706.1 (*Gallus gallus domesticus*, Mexico/South, 12/14/2021, IBV/ck/Mex/2956/21, serotype: GI-9)

Two mutations (U to C at positions 19,553 and 19,562 of reference strain NC\_001451.1, introducing mismatches in extended duplex)27: **MN548285.2** (*Gallus gallus*, United Kingdom, 01/2011, strain CR88); **OM912697.1** (Vaccine isolate, Mexico, 04/23/2019, IBV/ck/MEX/1619/19, serotype: CI-13 [793B or 4/91-like])

Two mutations (U to C and a to U at positions 19,553 and 19,557 of reference strain NC\_001451.1, introducing mismatches in extended duplex)28: **MK618759.1** (Chicken, South Korea, 2012, isolate K04712)

Two mutations (U to C at positions 19,538 and 19,553 of reference strain NC\_001451.1, introducing mismatches in extended duplex)29: **MN096598.1** (Chicken, China, 2016)

Two mutations (U to C at positions 19,547 and 19,553 of reference strain NC\_001451.1, introducing mismatches in duplex portion with sense=antisense)30: **KU900744.1** (*Gallus gallus*, South Korea, 2006, QIA-Q43); **MN517817.1** (*Gallus gallus*, China, 2011); **MN509588.1** (*Gallus gallus*, China, 2017)

Two mutations (U to C at positions 19,547 and 19,558 of reference strain NC\_001451.1, introducing mismatches in extended duplex)31: **MT984594.1** (Gallus gallus, Greece, 2011, strain: D1760/2/2/2011/GR)

Two mutations (U to C and G to A at positions 19,547 and 19,551, respectively, of reference strain NC\_001451.1, introducing mismatches in duplex portion with sense=antisense)32: **KX364298.1** (*Gallus gallus*, China, 2005, cK/CH/LDL/05II, genotype LX4); **KX348114.1** (*Gallus gallus*, China, 2005, cK/CH/LDL/05III, genotype: LX4)

Two mutations (A to G at position 19,541 and U to C at position 19,544 of reference strain NC\_001451.1, introducing mismatch in extended duplex)33: **MK581204.1** (*Gallus gallus*, Poland, 1997); **OR268746.1** (*Gallus gallus*, Mexico, 2007, isolate Mex 07-1); **OR268748.1** (*Gallus gallus*, Mexico, 2007, isolate Mex-07-3); **MT984586.1** (*Gallus gallus*, Romania, 2010, strain: D1530/2/3/2010/RO); **MT984587.1** (*Gallus gallus*, Romania, 2010, strain: D1530/4/1/2010/RO); **KX364299.1** (*Gallus gallus*, China, 2010, cK/CH/LSD/101223, genotype: LX4); **KX259250** (*Gallus gallus*, China, 2010, cK/CH/LJS, 10113); **KX219794.1** (*Gallus gallus*, Chicken, 11/2010, cK/CH/LJS,101109, genotype: LX4); **KX302862.1** (*Gallus gallus*, China, 11/2010, cK/CH/LJS/101111, genotype: LX4); **KP118884.1** (*Gallus gallus*, China, 2011, ck/CH/LSD/110851); **KP118885.1** (*Gallus gallus*, China, 2011, ck/CH/LSD/110857); **KP118893.1** (*Gallus gallus*, China, 2011,ck/CH/LSD/110410); **KJ135013.1** (*Gallus gallus*, Ukraine, 10/2011, isolate IBVUkr27-11); **JX195176.1** (Chicken, China, 11/03/2011, ck/CH/LZJ/111113); **KP118883.1** (*Gallus gallus*, China, 2012, ck/CH/LHB/121041); **KP036503.1** (*Gallus gallus*, China, 2012, ck/CH/LHB/121010); **MK581206.1** (*Gallus gallus*, Poland, 12/14/2012); **KP118888.1** (*Gallus gallus*, China, 2013, ck/CH/LLN/130102); **KP118889.1** (*Gallus gallus*, China, 2013, ck/CH/LHB/130575); **KP118890.1** (*Gallus gallus*, China, 2013, ck/CH/LHB/130578); **KP118892.1** (*Gallus gallus*, China, 2013, ck/CH/LLN/13101); **KP036504.1** (*Gallus gallus*, China, 2013, ck/CH/LHB/130630); KP118880.1 (*Gallus gallus*, China, 2013, ck/CH/LHB/130927); **KX236009.1** (*Gallus gallus*, China, 01/2013, cK/CH/LSX/130132, genotype: LX4); **KF377577.1** (IBV, 07/06/2013, 4/91 [vaccine strain], Al-Jallad et al. 2020); **KP118887.1** (*Gallus gallus*, China, 2014, ck/CH/LHB/140532); **KP118881.1** (*Gallus gallus*, China, 2014, ck/CH/LBJ/140413); **KP118882.1** (*Gallus gallus*, China, 2014, ck/CH/LBJ/140402); **MT665806.1** (Chicken, Canada, 2017, IBV/Ck/Can/17-038913); **OQ434268.1** (Chicken, Pakistan, 05/17/2017, Ch/IBV/Pak/AW-2/GI-13/2017, genotype: GI-13); **OR050555.1** (Broiler, South Korea, 12/28/2018, IBV/Korea/193/2018); **MN794188.1** (*Gallus gallus*, China, 2019); **ON044998.1** (*Gallus gallus*, China, 2019, isolate 05/P1-D1/Tr4); **MZ367369.1** (*Gallus gallus*, Belgium, 2019, IBV/chicken/Belgium/4134\_001/2019); **OR268744.1** (*Gallus gallus*, Mexico, 2020, isolate Mex-15); **OR050564.1** (Broiler, South Korea, 03/05/2020, IBV/Korea/140/2020); **OM9126879.1** (*Gallus gallus domesticus* (Broiler), Mexico/South, 07/20/2020, IBV/ck/MEX/2752/21, serotype: GI-13 [793B or 4/91-like] [vaccine strain]); **OM912680.1** (*Gallus gallus domesticus* (Broiler), Mexico/South, 11/25/2020, IBV/ck/MEX/2353/20, serotype: GI-13 [793B or 4/91-like] [vaccine strain]); **OM912682.1** (*Gallus gallus domesticus* (Broiler), Mexico/South, 11/25/2020, IBV/ck/MEX/2354/20, serotype: GI-13 [793B or 4/91-like] [vaccine strain]); **OM912692.1** (*Gallus gallus domesticus*, Mexico/South, 04/01/2021, IBV/cx/MEX/2592/21, serotype: GI-13 [793B or 4/91-like] [vaccine strain]); **OP737828.1** (Chicken, China, 04/14/2021, IBV/chicken/Hubei/S1402/2021); **OM912689.1** (*Gallus gallus domesticus*, Mexico/North, 06/06/2021, IBV/ck/MEX/2725/21, serotype: GI-13 [793B or 4/91-like] [vaccine strain]); **OM912690.1** (*Gallus gallus domesticus*, Mexico/North, 06/06/2021, IBV/ck/MEX/2723/21, serotype: GI-13 [793B or 4/91-like] [vaccine strain]); **OM912691.1** (*Gallus gallus domesticus*, Mexico/North, 06/06/2021, IBV/ck/MEX/2721/21, serotype: GI-13 [793B or 4/91-like] [vaccine strain]); **OM912676.1** (*Gallus gallus domesticus*, Mexico/Central, 06/23/2021, IBV/ck/MEX/2731/21, serotype: GI-3 (Holte/Iowa-97]); **OM912686.1** (*Gallus gallus domesticus*, Mexico/South, 07/20/2021, IBV/ck/MEX/2753/21, serotype: GI-13 [793B or 4/91-like] [vaccine strain]); **OM912701.1** (*Gallus gallus domesticus*, Mexico/South, 09/13/2021; IBV/ck/MEX/2826/21, serotype: GI-13 [793B or 4/91-like] [vaccine strain]); **OM912702.1** (*Gallus gallus domesticus*, Mexico/North, 09/27/2021, IBV/ck/MEX/2833/21, serotype: GI-13 [793B or 491-like] [vaccine strain]); **OM912699.1** (*Gallus gallus domesticus*, Mexico,/North, 10/10/2021, IBV/ck/MEX/2818/21, serotype: GI-13 [793B or 4/91-like] [vaccine strain]); **OM912700.1** (*Gallus gallus domesticus*, Mexico,/North, 10/10/2021, IBV/ck/MEX/2819/21, serotype: GI-13 [793B or 4/91-like] [vaccine strain]); **OM912705.1** (*Gallus gallus domesticus*, Mexico/North, 12/07/2021, IBV/ck/Mex/2944/21, serotype: GI-17 [CAV]); **ON044997.1** (*Gallus gallus*, China, 2022, isolate 05/P1-D3/Tr3); **ON044999.1** (*Gallus sp.*, China, 2022, isolate 05/P1-D1/Tr1); **ON081490.1** (*Gallus sp.*, China, 2022, isolate 05/P2-D5/Lu3); **ON081491.1** (*Gallus sp.*, China, 2022, isolate 05/P2-D3/Pr5); **ON081486.1** (*Gallus sp.*, China, 2022, isolate 05/P2-D5/Pr2); **ON081487.1** (*Gallus sp.*, China, 2022, isolate 05/P2-D3/Tr5); **ON081488.1** (*Gallus sp.*, China, 2022, isolate 05/P2-D5/Pr3); **ON081489.1** (*Gallus sp.*, China, 2022, isolate 05/P2-D5/Tr1); **ON081492.1** (*Gallus sp.*, China, 2022, isolate 05/P2-D1/Tr2); **ON081494.1** (*Gallus sp.*, China, 2022, isolate 05/P2-D5/Tr3); **ON081493.1** (*Gallus sp.*, China, 2022, isolate 05/P2-D5/Tr4); **OR824985.1** (*Gallus gallus*, India, 12/18/2022, IBV/India/ck/03/23, genotype: GI-13 [793B or 4/91-like] [vaccine strain]); **OR824986.1** (*Gallus gallus*, India, 12/18/2022, IBV/India/ck/03/23, genotype: GI-13 [793B or 4/91-like] [vaccine strain]); **OR824987.1** (*Gallus gallus*, India, 12/18/2022, IBV/India/ck/03/23, genotype: GI-13 [793B or 4/91-like] [vaccine strain])

Two mutations (A to G at position 19,541 and U to C at position 19,553 of reference strain NC\_001451.1, introducing mismatch in extended duplex)34: **LN610099.1** (Guinea fowl, France, 2011, gammaCoV/guinea fowl/S/2011)

Two mutations (A to G at position 19,541 and U to C at position 19,563 of reference strain NC\_001451.1, introducing mismatch in extended duplex)35: **MK778365.1** (*Gallus gallus*, Australia, 1991, Ck/Aus/V18/91, genotype: GIII-1); **MK778364.1** (*Gallus gallus*, Australia, 1992, Ck/Aus/V6/92, genotype: GIII-1)

Two mutations (U to C at positions 19,544 and 19,553 of reference strain NC\_001451.1, introducing mismatches in extended duplex)36: **GQ504725.1** (Chicken, USA, 1941, strain Mass41 [vaccine strain], Amarasinghe et al 2018); **GU393335.1** (*Gallus gallus*, Netherlands, 1960, serotype: H120 [vaccine strain]); **FJ888351.1** (*Gallus gallus*, Netherlands, 1960, strain H120 [vaccine strain]); **FJ904716.1** (Chicken, USA, 1966, strain: Conn46 1966, serotype: Connecticut [vaccine strain]); **GU393333.1** (*Gallus gallus*, USA, 1971, serotype: FL18288; clusters with Conn 46 vaccine isolates); **FJ904717.1** (Chicken, USA, 1972, strain: Conn46 1972 [vaccine strain], serotype: Connecticut); **MH021175.1** (*Gallus gallus*, Netherlands, 1979, strain D274 [vaccine strain], genotype: GI-12); **GQ504721.1** (Chicken, USA, 1981, Arkansas vaccine strain); **FJ904718.1** (Chicken, USA, 1983, strain: Conn46 1983, serotype: Connecticut [vaccine strain]); **KR231009.1** (*Gallus gallus*, Belgium, 1984, strain B1648, serotype: Belgian nephropathogenic infectious bronchitis); **MK581200.1** (*Gallus gallus*, Poland, 06/08/1989, strain gammaCoV/Ck/Poland/78/1989); **MK581201.1** (*Gallus gallus*, Poland, 06/08/1989, strain gammaCoV/Ck/Poland/79/1989); **MK581202.1** (*Gallus gallus*, Poland, 06/08/1989, strain gammaCoV/Ck/Poland/80/1989); **GU393331.1** (*Gallus gallus*, USA, 1991, serotype: Cal56B); **FJ904719.1** (Chicken, USA, 1991, strain: Conn46 1991, serotype: Connecticut [vaccine strain]); **GU393332.1** (*Gallus gallus*, USA, 1992, serotype: Delaware 072 [vaccine strain]); **MN566147.1** (Broiler, USA, 1994, [vaccine strain ArkDPI but virulent form also present in group 36], Goraichuk et al. 2020); **FJ904714.1** (Chicken, USA, 1995, strain Cal 1995, serotype: California); **M21515.1** (Chicken embryo kidney cell, Japan, 05/18/1995, strain KB8523, severe respiratory disease, no nephritis or nephrosis); **JX195177.1** (Chicken, China, 1997, strain ck/CH/LDL/97I, substrain P5 [attenuated potential vaccine strain], Zhao et al. 2014); **EU714028.1** (*Gallus gallus*, China, 1997, isolate ZJ971 [non-pathogenic]. Liu X et al. 2013); **GQ504722.1** (Chicken, USA, 1998, strain: Georgia 1998 pass8, virulent); **GQ504723.1** (Chicken, USA, 1998, strain: Georgia 1998 Vaccine from GQ504722.1, avirulent); **ON419888.1** (*Gallus gallus*, Argentina, 2001, isolate AR/01/BA/LDBI-15, recombination of GI-11 and GI-16 lineages); **JX195178.1** (Chicken, China, 2001, strain ck/CH/LDL/97I, substrain P115 [attenuated potential vaccine strain], Zhao et al. 2014); **FJ904715.1** (Chicken, USA, 2003, strain: Cal557 2003, serotype: California); **GQ427173.1** (Turkey, USA, 2003, strain: TCoV/VA-74/03); **KY273667.1** (IBV, Jordan/Massachusetts/USA, 2004, Jordan/Mass/15/2004); **MN711790.1** (Broiler, USA, 10/05/2004, isolate GA/1472/2004, genotype GA08, Var-2 strain); **FJ904713.1** (Chicken, USA, 2006, strain Mass41 2006, serotype: Massachusetts [vaccine strain]); **ON419885.1** (*Gallus gallus*, Argentina, 2006, AR/06/BA/LDBI-20, Var-2 strain); **ON419886.1** (*Gallus gallus*, Argentina, 2006, AR/06/BA/LDBI-22, Var-2 strain); **ON419890.1** (*Gallus gallus*, Argentina, 2006, AR/06/BA/LDBI-19, Var-2 strain); **ON419889.1** (*Gallus gallus*, Argentina, 2006, AR/06/BA/LDBI-21, Var-2 strain); **AY514485.1** (IBV, 04/06/2007, strain Cal99, serotype: California 99); **JF330899.1** (Chicken, China, 2009, ck/CH/LNM/090107 [non-pathogenic] Liu et al., 2013); MF421319.1 (*Gallus gallus*, Uruguay, 2009, UY/09/CA/01); **EU418976.1** (IBV passage 11, USA, 03/06/2009, strain ArkDPI11, virulent, Ammayappan et al. 2009); **EU418975.1** (IBV passage 101, USA, 03/06/2009, strain ArkDPI101, avirulent derived from EU418976.1, Ammayappan et al. 2009); **FJ807652.1** (Embryonated chicken eggs, China, 04/06/2009, strain: H120 [vaccine strain]); **KJ425503.1** (*Gallus gallus*, China, 09/08/2009, ck/CH/LHLJ/090908); KJ425508.1 (Gallus gallus, China, 09/09/2009, ck/CH/LHN/090909); **JF828981.1** (Chicken, China, 2010, ck/CH/LDL/101212 [non-pathogenic], Liu et al. 2013); **MT984588.1** (*Gallus gallus*, Hungary, 2011, strain: D1561/18/2011/HU); **MT984593.1** (*Gallus gallus*, Greece, 2011, strain: D1719/1/2011/GR; **MN548287.1** (*Gallus gallus*, United Kingdom, 01/2011, strain: H120 [vaccine strain]); **MN548288.1** (*Gallus gallus*, United Kingdom, 01/2011, strain italy02, second genotype most prevalent in Italy); **KJ425505.1** (*Gallus gallus*, China, 03/10/2011, ck/CH/LHLJ/110310); **KJ425486.1** (*Gallus gallus*, China, 05/23/2011, ck/CH/LHB/110557); **KJ425487.1** (*Gallus gallus*, China, 05/26/2011, ck/CH/LHB/110526); **KJ435280.1** (*Gallus gallus*, China, 05/29/2011, ck/CH/LSD/110505); **KJ435281.1** (*Gallus gallus*, China, 05/29/2011, ck/CH/LSD/110529 [derived from flock vaccinated with live attenuated H120]); **KJ435282.1** (*Gallus gallus*, China, 07/26/2011, ck/CH/LSD/110726, [derived from flock vaccinated with live attenuated H120]); **KC506155.1** (Chicken, China, 10/10/2011, ck/CH/LJL111054, originated from a H120-vaccinated chicken, further genomic analysis revealed recombination events between Conn- and Mass-like strains); **KF411040.1** (Chicken, China, 11/22/2011, CK/CH/LLN/111169, originated from multiple recombination events between GI-19 and the Connecticut [Conn] and 4/91 vaccine strains); **KF696629.1** (IBV, China, 08/01/2013, Connecticut vaccine strain); **KJ425488.1** (*Gallus gallus*, China, 08/25/2011, ck/CH/LHB/110825, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains); **KJ425485.1** (*Gallus gallus*, China, 09/17/2011, ck/CH/LHB/110931, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, pathogenic to specific pathogen-free chickens); **KJ425506.1** (*Gallus gallus*, China, 10/22/2011, ck/CH/LHLJ/111050, originated from multiple recombination events between IBV strains 4/91 and H120, Zhang et al. 2015); **KJ425489.1** (*Gallus gallus*, China, 11/18/2011, ck/CH/LHB/111172, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, Zhou S et al. 2014); **KJ425491.1** (*Gallus gallus*, China, 12/18/2011, ck/CH/LHB/111268, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, pathogenic to specific pathogen-free chickens, Zhou et al., 2014); **KJ425490.1** (*Gallus gallus*, China, 12/21/2011, ck/CH/LHB/111232, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, pathogenic to specific pathogen-free chickens, Zhou et al. 2014); **KJ435283.1** (*Gallus gallus*, China, 12/19/2011, ck/CH/LSD/111214, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, pathogenic to specific pathogen-free chickens, Zhou et al. 2014); **KJ435284.1** (*Gallus gallus*, China, 12/23/2011, ck/CH/LSD/111241, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, pathogenic to specific pathogen-free chickens, Zhou et al. 2014); **KT203557.1** (Chicken, India, 2012, isolate B17, serotype: Massachusetts, vaccine strain [Poulvac® IB Mass); **MT984596.1** (*Gallus gallus*, Hungary, 2012, strain: D1871/1/1/2012/HU, belongs to the Variant-2 strain [vaccine strain-derived], Al-Jallad et al 2020); **ON419879.1** (*Gallus gallus*, Uruguay, 2012, UY/12/CA/35, GI-16 lineage); **KJ425492.1** (*Gallus gallus*, China, 04/03/2012, ck/CH/LHB/120403, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, pathogenic to specific pathogen-free chickens, Zhou et al. 2014); **KJ425493.1** (*Gallus gallus*, China, 07/21/2012, ck/CH/LHB/120749, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, Han Z et al. 2011); **KJ425509.1** (*Gallus gallus*, China, 10/23/2012, ck/CH/LSD/121059, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, pathogenic to specific pathogen-free chickens, Zhou et al. 2014); **KJ4255494.1** (*Gallus gallus*, China, 10/24/2012, ck/CH/LHB/121024, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, pathogenic to specific pathogen-free chickens, Zhou et al. 2014); **KJ4255495.1** (*Gallus gallus*, China, 10/26/2012, ck/CH/LHB/121040, , originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, pathogenic to specific pathogen-free chickens, Zhou et al. 2014); **KJ435285.1** (*Gallus gallus*, China, 12/28/2012, ck/CH/LSD/121228, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, pathogenic to specific pathogen-free chickens, Zhou et al. 2014); **MG913343.1** (*Gallus gallus*, Brazil, 2013, AvCoV/Gallus gallus/Brazil/sample 22/2013, genotype GI-1); **MG763935.1** (Chicken, India, 2013, isolate IBV/Chicken/Haryana/53/2013, [might be a revertant strain originally evolved from the live attenuated vaccine strains used in the region](https://europepmc.org/article/MED/29621536), Jakhesara et al 2018); **KP868573.1** (*Gallus gallus*, China, 2013, CK/CH/LJL/130908, , originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, pathogenic to specific pathogen-free chickens, Zhou et al. 2014); **ON419884.1** (*Gallus gallus*, Argentina, 2013, AR/13/BA/A13); **ON419883.1** (*Gallus gallus*, Argentina, 2013, AR/13/BA/A255); **ON419882.1** (*Gallus gallus*, Argentina, 2013, AR/13/CB/A253); **MZ325300.1** (*Gallus gallus*, Cote d’Ivoire, 2013, strain D2334/12/2/13/CI, Var-2-derived strain); **KP780179.1 9** (Chicken, Italy, 05/13/2013, gammaCoV/Ck/Italy/I2022/13, genotype: Q1-like); **KJ425497.1** (*Gallus gallus*, China, 05/24/2013, ck/CH/LHB/130598, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, pathogenic to specific pathogen-free chickens, Zhou et al. 2014); **KJ425496.1** (*Gallus gallus*, China, 05/25/2013, ck/CH/LHB/130573, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, pathogenic to specific pathogen-free chickens); **KJ425498.1** (*Gallus gallus*, China, 06/18/2013, ck/CH/LHB/130642, originated from multiple recombination events between GI-19 and the Connecticut (Conn) and 4/91 vaccine strains, pathogenic to specific pathogen-free chickens, Zhou et al. 2014); **KJ425499.1** (*Gallus gallus*, China, 11/18/2013, ck/CH/LHB/131118); **KJ425500.1** (*Gallus gallus*, China, 11/21/2013, ck/CH/LHB/131132); **KJ425501.1** (*Gallus gallus*, China, 11/26/2013, ck/CH/LHB/131142); **KJ425502.1** (*Gallus gallus*, China, 11/26/2013, ck/CH/LHB/131143); **KJ425507.1** (*Gallus gallus*, China, 12/16/2013, ck/CH/LHJ/131216); **MK937833.1** (*Gallus*, China, 2014, strain ck/CH/LJL/140820); **KY805845.1** (*Gallus gallus*, Egypt, 2014, IBV/Ck/EG/CU/1/2014, GI-1, closely related to vaccine strain H120, Abozeid et al. 2017); **ON419880.1** (*Gallus gallus*, Uruguay, 2014, UY/14/CA/37); **MH779860.1** (*Gallus gallus*, USA, 2014, strain Ark99, serotype: Arkansas [vaccine strain]); **KY588134.1** (IBV, Pakistan, 2015, serotype Massachusetts, Pakistan/Mass/1003/2A/2015, Var-2 strain, Bande et al. 2017); **KY588135.1** (Chicken, Pakistan, 2015 serotype Massachusetts, Pakistan/Mass/1009/13A/2015, Var-2 strain, Bande et al. 2017); **ON419881.1** (*Gallus gallus*, Uruguay, 2015, UY/15/CA/36-1); **KT736031.1** (*Gallus gallus*, China, 04/2015, ck/CH/LDL/150434-I, re-isolation of the H120 vaccine strain introduced into a chicken flock by vaccination); **KT736032.1** (*Gallus gallus*, China, 04/2015, ckCHLDL150434-II); **KY626045.1** (IBV, Brazil, 2016, Massachusetts type vaccine strain, GI-1); **KY047602.1** (*Gallus gallus*, Poland, 02/2016, gammaCoV/Ck/Poland/G052/2016, genotype: GI-23 [Var2-like]); **MK581207.1** (*Gallus gallus*, Poland, 04/07/2016, strain gammaCoV/Ck/Poland/G103/2016); **MN757859.1** (*Gallus gallus* (broiler), Costa Rica, 09/05/2016, isolate CK/CR/1160/12, strain GA 13-like, serotype: GI-17); **MN512434.1** (Chicken, Canada, 2017, isolate IBV/Ck/Can/17-035614); **MN512435.1** (Chicken, Canada, 2017, isolate IBV/Ck/Can/17-036989); **MN512436.1** (Chicken, Canada, 2017, isolate IBV/Ck/Can/18-048192T); **MN512437.1** (Chicken, Canada, 2017, isolate IBV/Ck/Can/18-048430); **MN512438.1** (Chicken, Canada, 2017, isolate IBV/Ck/Can/18-049707); **ON950740.1** (*Gallus gallus*, Canada, 2017, IBV/Ck/Can/2558004); **OM525798.1** (Chicken, Arizona/USA, 2017, isolate FLS/AZ/17,  associated with false layer syndrome); **MK937829.1** (*Gallus*, China, 2017, strain I0306/17); **KY776700.1** (*Gallus gallus*, China, 03/14/2017, gamma CoV/China/I0712/11); **MZ327723.1** (Guinea fowl, France, 05/2017, gCoV/AvCoV/Guineafowl/France/I172562a1/2017); **MZ327724.1** (Guinea fowl, France, 05/2017, gCoV/AvCoV/Guineafowl/France/I172562a2/2017); **OQ434267.1** (Chicken, Pakistan, 05/17/2017, Ch/IBV/Pak/AW-1/GI-1/2017, genotype: GI-1); **KY776701.1** (*Gallus gallus*, China, 2017, gamma CoV/ck/China/IO108/17); **MK581208.1** (*Gallus gallus*, Poland, 07/07/2017, strain gammaCoV/Ck/Poland/G225/2017, Var-2 strain); **ON713866.1** (*Gallus gallus*, Bangladesh, 11/2017, isolate IVL-BD-IB, strain Massachusetts, Var-2 strain); **OR268743.1** (*Gallus gallus*, Mexico, 2018, isolate Mex-Ark1); **MT176421.1** (Chicken, USA, 07/25/2018, IBV/Ck/USA/PA/P1810234-TR, serotype: DMV/1639, Var-2 strain); **MT176422.1** (Chicken, USA, 07/26/2018, IBV/Ck/USA/PA/P1810234-KD, serotype: DMV/1639, Var-2 strain); **MK071267.1** (*Gallus*, Brazil, 10/17/2018, strain H120 [vaccine strain]); **MK878536.1** (Chicken, USA, 01/10/2019, strain DMV/1639); **OM912696.1** (Vaccine isolate, Mexico, 04/23/2019, IBV/ck/MEX/1623/19, serotype: GI-1 [Massachusetts type]); **MK937831.1** (*Gallus*, China, 05/15/2019, strain H120, vaccine strain); **MW436704.1** (*Gallus*, China, 2020, strain IBV/M41/Y185, inactivated vaccine strain); **KR822424.1** (*Gallus*, China, 2020, strain HV80, Var-2 strain); **OP684009.1** (*Gallus*, China, 2020, strain HV80, Var-2 strain); **MZ367367.1** (*Gallus gallus*, Belgium, 2020, IBV/chicken/Belgium/4439\_001-iPLTB/2020, 99.95% nucleotide identity to the vaccine strain H120, lineage GI-1); **MZ367368.1** (*Gallus gallus*, Belgium, 2020, IBV/chicken/Belgium/4439\_001-PLTB/2020); **MW024789.1** (Gallus gallus [layer], USA, 01/06/2020, strain IA11g2/2000, serotype: GI-17); **PP373115.1** (*Gallus gallus*, Canada, 2021, IBV/Ck/can/21-2455844); **OM912684.1** (*Gallus gallus domesticus* (Broiler), Mexico/South, 04/01/2021, IBV/ck/MEX/2602/21, serotype: GI-1 [Massachusetts type]); **OM912685.1** (*Gallus gallus domesticus* (Broiler), Mexico/North, 04/01/2021, IBV/ck/MEX/2598/21, serotype: GI-1 [Massachusetts type]); **OM912683.1** (*Gallus gallus domesticus* (Broiler), Mexico/South, 07/11/2021, IBV/ck/MEX/2743/21, serotype: GI-1 [Massachusetts type]); **OM912687.1** (*Gallus gallus domesticus*, Mexico/South, 07/15/2021, IBV/ck/MEX/2748/21, serotype: GI-1 [Massachusetts type]), **OM912681.1** (*Gallus gallus domesticus* (Broiler), Mexico/South, 07/20/2021, IBV/ck/MEX/2754/21, serotype: GI-1 [Massachusetts type]); **OM912703.1** (*Gallus gallus domesticus*, Mexico/South, 10/12/2021, IBV/ck/MEX/2860/21, serotype: GI-1 [Mass type]); **LC683779.1** (*Gallus gallus domesticus*, Japan, 02/10/2022, strain: JP/Toyama/2000); **ON350836.1** (*Gallus gallus*, Netherlands, 04/20/2022, strain H120 [vaccine strain]); **ON350837.1** (*Gallus gallus*, China, 04/21/2022, strain r-H120-QX(S) [vaccine strain]); **OR397128.1** (Chicken, Mexico, 04/13/2023, IBV/ck/Mexico/3595-20LM/2023)

Three mutations (U to C at positions 19,544 19,553 and A to G at position 19,558 of reference strain NC\_001451.1, introducing mismatch in extended duplex)37: **GQ504720.1** (Chicken, USA, 1981, strain Arkansas DPI); **MH779860.1** (*Gallus gallus*, USA, 2014, strain Ark99, serotype: Arkansas); **MH779856.1** (*Gallus gallus*, USA, 2014, isolate ArkGA\_P1, strain Ark99, serotype: Arkansas); **MH779857.1** (*Gallus gallus*, USA, 2015, isolate ArkGA\_P90, strain Ark99, serotype: Arkansas); **MH779858.1** (*Gallus gallus*, USA, 2016, isolate ArkGA\_P40, strain Ark99, serotype: Arkansas)

Two mutations (U to C at positions 19,544 and 19,559 of reference strain NC\_001451.1, introducing mismatch in extended duplex)38: **KX272465.1** (*Gallus gallus*, Sudan, 10/01/2014, isolate AR-251-15); **MK142676.1** (Chicken, China, 2016, isolate ahysx-1); **MW896953.1** (Chicken, Henan/China, 09/13/2017, isolate 260R-6772); **OP737823.1** (Chicken, China, 03/17/2021, IBV/chicken/Sichuan/C1452/2021); **OP737827.1** (Chicken, China, 05/11/2021, IBV/chicken/Ningxia/N1394/2021); OQ189490.1 (Chicken, China, 06/2021, CK/CH/SX/2106)

Two mutations (U to C at positions 19,544 and 19,547 of reference strain NC\_001451.1, introducing mismatches in duplex portion with sense=antisense)39: **KX375808.1** (*Gallus gallus*, China, 1999, cK/CH/LHLJ/99I, genotype LX4); **AY319651.1** (IBV, China, 06/10/2003, isolate BJ); **KM213963.1** (*Gallus gallus*, China, 2013, CK/CH/XDC-2/2013); **KX185056.1** (*Gallus gallus*, China, 2014, strain LD3); **KX272465.1** (*Gallus gallus*, China, 05/04/2016, strain LH1); **MT563407.1** (Chicken, China, 04/12/2019, strain SC/SDL/19); **OR180678.1** (Chicken, Dar es Salaam/Bugurini/Tanzania, 11/21/2019, IBV/ck/Tanzania/Dar es Salaam/Bugurini/1995-B01/18, genotype: GI-19)

One mutation (U to A at position 19,553 of reference strain NC\_001451.1, introducing mismatch in duplex portion with sense=antisense)40: **MW429061.1** (*Gallus*, China, 2020, strain IBV/M41/Y28, M41 is inactivated vaccine strain)

One mutation (U to C at position 19,562 of reference strain NC\_001451.1, introducing mismatch in extended duplex)41: **KX259253.1** (*Gallus gallus*, China, 2012, strain ck/CH/LHN/120338); **MH878976.1** (*Gallus gallus*, Peru, 02/22/2014, isolate VFAR-047, genotype: GI-16)

Two mutations (A to U and A to C at positions 19,533 and 19,558, respectively, of reference strain NC\_001451.1, introducing mismatches in extended duplex)42**: MH453802.1** (Red-necked Avocet, Innaminka Regional Reserve/Australia, 2013); **NC\_048214.1** (Duck, China, 2014, isolate DK/GD/27/2014); **MK204393.1** (*Anas gracilis* [Grey Teal duck], Victoria, Australia, 2017); **MK204411.1** (*Tadorna tadornoides* [sheduck], Victoria/Australia, 2017)

Three mutations (U to C at positions 19,532, 19,544, and 19,559, respectively, of reference strain NC\_001451.1, introducing mismatches in extended duplex)43: **OR050547.1** (Chicken [Broiler], South Korea, 04/17/2018, isolate IBV/Korea/61/2018); **OR050559.1** (Chicken [Layer], South Korea, 05/23/2019, isolate IBV/Korea/40/2019); **OR050544.1** (Chicken [Broiler], South Korea, 02/18/2020, isolate IBV/Korea/25/2020); **OR050548.1** (Chicken [Broiler], 04/10/2020, isolate IBV/Korea/63/2020); **OR050549.1** (Chicken [Broiler], 04/17/2020, isolate IBV/Korea/68/2020); **OR050551.1** (Chicken [Broiler], 05/06/2020, isolate IBV/Korea/77/2020); **OR050563.1** (Chicken [Broiler], South Korea, 06/16/2020, isolate IBV/Korea/111/2020); **OQ189491.1** (Chicken, China, 04/2022, CK/CH/SX/2204, genotype: GVI-1)

Three mutations (U to C at positions 19,532, 19,553, and 19,559, respectively, of reference strain NC\_001451.1, introducing mismatches in extended duplex)44: **OQ749506.1** (Chicken [Farm], China, 07/01/2021, isolate DLSL21)

Three mutations (A to U, U to C, and A to C at positions 19,533, 19553, and 19,558, respectively, of reference strain NC\_001451.1, introducing mismatches in extended duplex)45: **KT254295.1** (Duck-dominant CoV, China, 2014, isolate DdCoV/DK/Guangdong/F11/2014, GI-11 lineage); **KT254296.1** (Duck-dominant CoV, China, 2014, isolate DdCoV/DK/Guangdong/F40/2014)

Three mutations (U to C at positions 19,544 19,553 and A to C at position 19,557 of reference strain NC\_001451.1, introducing mismatches in extended duplex)46: **ON419887.1** (*Gallus gallus*, Argentina, 2001, isolate AR/01/BA/LDBI-5, genotype: GI-11)

Three mutations (U to C at position 19,529 and 19,544, and A to G at position 19,541 of reference strain NC\_001451.1, introducing mismatches in extended duplex)47: **KP662631.1** (*Gallus gallus*, South Africa, 06/01/2011, isolate ck/ZA/3665/11, serotype: QX-like)

Three mutations (C to G at position 19,537, A to G at position 19,541, U to C at position 19,544, of reference strain NC\_001451.1, introducing mismatches in extended duplex)48: **KP118891.1** (*Gallus gallus*, China, 2011, strain ck/CH/LHLJ/111246; genotype: GI-13)

Three mutations (U to C at position 19,534, A to G at position 19,541, U to C at position 19,544, of reference strain NC\_001451.1, introducing mismatches in extended duplex)49: **KP036502.1** (*Gallus gallus*, China, 2014, ck/CH/LHLJ/140906)

Three mutations (U to C at positions 19,553, and 19,559, and G to A at position 19,563, of reference strain NC\_001451.1, introducing mismatches in extended duplex)50: **OM912708.1** (*Gallus gallus domesticus* [Broiler], Mexico/Central, 12/15/2021), IBV/ck/MEX/2961/21, serotype: GI-9 [Arkansas type])

Three mutations (A to G at position 19,530, A to U at position 19,531, and U to C at position 19,559, of reference strain NC\_001451.1, introducing mismatches in extended duplex)51: **MW896949.1** (Chicken, Jiangsu/China, 09/09/2017, isolate 71-109646)

Three mutations (U to C at positions 19,532 and 19,544, and U to A at position 19,562, of reference strain NC\_001451.1, introducing mismatches in extended duplex)52: **MZ325299.1** (*Gallus gallus*, Cote d’Ivoire, 2013, strain D2334/11/2/3/CI)

Three mutations (A to G at position 19,541, and U to C at positions 19,544 and 19,562, of reference strain NC\_001451.1, introducing mismatches in extended duplex)53: **MT367412.1** (*Meleagris gallopavo*/Turkey, Poland, 06/21/2016, gammaCoV/Tk/ Poland/G160/2016)

Three mutations (U to C at positions 19,544 and 19,559, and A to G at position 19,550, of reference strain NC\_001451.1, introducing mismatches in extended duplex)54: **GQ427176.1** (Turkey, USA, 1998, TCoV/TX-1038/98); **GQ427174.1** (Turkey, USA, 2001, TCoV/TC-GL/01); **EU022525.1** (Turkey, Indiana/USA, 07/08/2007, TCoV-540)

Three mutations (U to C at positions 19,544 and 19,547, and A to G at position 19,550, of reference strain NC\_001451.1, introducing mismatches in extended duplex)55: **AY338732.1** (Chicken, China, 01/23/2003, strain LX4, nephropathogenic)

One deletion and 2 mutations (deletion of A at position 19,541, and U to C mutations at positions 19,544 and 19,547, of reference strain NC\_001451.1, introducing mismatches in extended duplex)56: **EU526388.1** (Chicken, China, strain A2, 02/20/2008, serotype: 4/91-like, a predominant strain in China)

Four mutations (U to C at position 19,529, C to U at position 19,542, U to A at position 19,544, and G to A at position 19,563 of reference strain NC\_001451.1, introducing mismatches in extended duplex)57: **MZ325298.1** (*Gallus gallus*, Ghana, 2013, strain D2328/15/3/13/GH, genotype: GI-19 [QX-like])

Four mutations (A to U and C at positions 19,533 and 19,558, respectively, and U to C at positions 19,544 and 19,562, of reference strain NC\_001451.1, introducing mismatches in extended duplex)58: **MT993597.1** (Duck CoV 2714 [*Arenaria interpres*, ruddy turnstone], Tasmania/Australia, 2015, isolate MW11-10)

Five mutations (A to C at position 19,531, U to A at position 19,532, A to G at positions 19,541 and 19,557, and G to A at position 19,556, of reference strain NC\_001451.1, introducing mismatches in extended duplex)59: **NC\_046965.1** (Canada goose CoV [*Branta canadiensis*], Canada, 08/2017, strain Cambridge\_Bay\_2017); **OR346994.1** (Swan goose CoV, China, 06/2022, isolate DWY40)

Six mutations (A to C at position 19,531, U to A at position 19,532, A to G at positions 19,541 and 19,557, U to C at position 19,544, and G to A at position 19,556, of reference strain NC\_001451.1, introducing mismatches in extended duplex)60: **MW588092.1** (Mute swan feces CoV, United Kingdom, 01/29/2021, strain Abbottsbury/A/2016)