**Amino acid sequences of NA gene constructs**

H7 HA Signal Sequence: *MNTQILVFALIAIIPTNADKI*

IgKappa Signal Sequence: *METDTLLLWVLLLWVPGSTGD*

Strep Tag II: SAWSHPQFEK

SpyTag: AHIVMVDAYKPTK

6His Purification Tag: HHHHHH

Tetrabrachion tetramerisation domain: IINETADDIVYRLTVIIDDRYESLKNLITLRADRLEMIINDNVSTILA

NA head sequence is coloured blue.

>mSN1 (A/mute swan/England/053054/2021)

*MNTQILVFALIAIIPTNADKI*SAWSHPQFEKGGGGSHHHHHHSSSGSGAHIVMVDAYKPTKGGSGGGGSIINETADDIVYRLTVIIDDRYESLKNLITLRADRLEMIINDNVSTILAGGSGTGSVTLAGNSSLCPISGWAIYSKDNGIRIGSKGDVFVIREPFISCSHLECRTFFLTQGALLNDKHSNGTVKDRSPYRTLMSCPVGEAPSPYNSRFESVAWSASACHDGISWLTIGISGPDNGAVAVVKYNGIITDTIKSWRNNILRTQESECACVNGSCFTVMTDGPSNGQASYKIFKIEKGKVVKSVELNAPNYHYEECSCYPDAGDIMCVCRDNWHGSNRPWVSFNQNLEYQIGYICSGVFGDNPRPNDGTGSCSPMSSNGAYGVKGFSFKYGNGVWIGRTKSTSSRSGFEMIWDPNGWTETDSSFSVKQDIVEITDWSGYSGSFVQHPEMTGLDCMRPCFWVELIRGRPKENTIWTSGSSISFCGVNSDTVGWSWPDGAELPFTIDK\*

>N1/09 (A/California/07/2009)

*METDTLLLWVLLLWVPGSTGD*HHHHHHGSGAHIVMVDAYKPTKGGGSIINETADDIVYRLTVIIDDRYESLKNLITLRADRLEMIINDNVSTILAGGSGTGISNTNFAAGQSVVSVKLAGNSSLCPVSGWAIYSKDNSVRIGSKGDVFVIREPFISCSPLECRTFFLTQGALLNDKHSNGTIKDRSPYRTLMSCPIGEVPSPYNSRFESVAWSASACHDGINWLTIGISGPDNGAVAVLKYNGIITDTIKSWRNNILRTQESECACVNGSCFTVMTDGPSNGQASYKIFRIEKGKIVKSVEMNAPNYHYEECSCYPDSSEITCVCRDNWHGSNRPWVSFNQNLEYQIGYICSGIFGDNPRPNDKTGSCGPVSSNGANGVKGFSFKYGNGVWIGRTKSISSRNGFEMIWDPNGWTGTDNNFSIKQDIVGINEWSGYSGSFVQHPELTGLDCIRPCFWVELIRGRPKENTIWTSGSSISFCGVNSDTVGWSWPDGAELPFTIDK\*

>N1/19 (A/Wisconsin/588/2019)

*MNTQILVFALIAIIPTNADKI*SAWSHPQFEKGGGGSHHHHHHSSSGSGAHIVMVDAYKPTKGGSGGGGSIINETADDIVYRLTVIIDDRYESLKNLITLRADRLEMIINDNVSTILAGGSGTGSVKLAGNSSLCPVSGWAIYSKDNSVRIGSKGDVFVIREPFISCSPLECRTFFLTQGALLNDKHSNGTIKDRSPYRTLMSCPIGEVPSPYNSRFESVAWSASACHDGTNWLTIGISGPDSGAVAVLKYNGIITDTIKSWRNKILRTQESECACVNGSCFTIMTDGPSDGQASYKIFRIEKGKIIKSVEMKAPNYHYEECSCYPDSSEITCVCRDNWHGSNRPWVSFNQNLEYQMGYICSGVFGDNPRPNDKTGSCGPVSSNGANGVKGFSFKYGNGVWIGRTKSISSRKGFEMIWDPNGWTGTDNKFSKKQDIVGINEWSGYSGSFVQHPELTGLNCIRPCFWVELIRGRPEENTIWTSGSSISFCGVDSDIVGWSWPDGAELPFTIDK\*

>N1/09 hybrid (N1/09 Loops - mSN1 Scaffold)

*MNTQILVFALIAIIPTNADKI*SAWSHPQFEKGGGGSHHHHHHSSSGSGAHIVMVDAYKPTKGGSGGGGSIINETADDIVYRLTVIIDDRYESLKNLITLRADRLEMIINDNVSTILAGGSGTGSVTLAGNSSLCPISGWAIYSKDNGIRIGSKGDVFVIREPFISCSHLECRTFFLTQGALLNDKHSNGTIKDRSPYRTLMSCPVGEAPSPYNSRFESVAWSASACHDGISWLTIGISGPDNGAVAVVKYNGIITDTIKSWRNNILRTQESECACVNGSCFTVMTDGPSNGQASYKIFKIEKGKVVKSVEMNAPNYHYEECSCYPDAGDIMCVCRDNWHGSNRPWVSFNQNLEYQIGYICSGIFGDNPRPNDKTGSCGPVSSNGANGVKGFSFKYGNGVWIGRTKSISSRNGFEMIWDPNGWTETDSSFSVKQDIVGINEWSGYSGSFVQHPEMTGLDCMRPCFWVELIRGRPKENTIWTSGSSISFCGVNSDTVGWSWPDGAELPFTIDK\*

>N1/19 hybrid (N1/19 Loops - mSN1 Scaffold)

*MNTQILVFALIAIIPTNADKI*SAWSHPQFEKGGGGSHHHHHHSSSGSGAHIVMVDAYKPTKGGSGGGGSIINETADDIVYRLTVIIDDRYESLKNLITLRADRLEMIINDNVSTILAGGSGTGSVTLAGNSSLCPISGWAIYSKDNGIRIGSKGDVFVIREPFISCSHLECRTFFLTQGALLNDKHSNGTIKDRSPYRTLMSCPVGEAPSPYNSRFESVAWSASACHDGISWLTIGISGPDNGAVAVVKYNGIITDTIKSWRNKILRTQESECACVNGSCFTVMTDGPSDGQASYKIFKIEKGKVVKSVEMKAPNYHYEECSCYPDAGDIMCVCRDNWHGSNRPWVSFNQNLEYQMGYICSGVFGDNPRPNDKTGSCGPVSSNGANGVKGFSFKYGNGVWIGRTKSISSRKGFEMIWDPNGWTETDSSFSVKQDIVGINEWSGYSGSFVQHPEMTGLDCMRPCFWVELIRGRPEENTIWTSGSSISFCGVNSDTVGWSWPDGAELPFTIDK\*

>PR8 N1 (A/PR/8/1934)

*MNTQILVFALIAIIPTNADKI*SAWSHPQFEKGGGGSHHHHHHSSSGSGAHIVMVDAYKPTKGGSGGGGSIINETADDIVYRLTVIIDDRYESLKNLITLRADRLEMIINDNVSTILAGGSGTGSVILTGNSSLCPIRGWAIYSKDNSIRIGSKGDVFVIREPFISCSHLECRTFFLTQGALLNDRHSNGTVKDRSPYRALMSCPVGEAPSPYNSRFESVAWSASACHDGMGWLTIGISGPDNGAVAVLKYNGIITETIKSWRKKILRTQESECACVNGSCFTIMTDGPSDGLASYKIFKIEKGKVTKSIELNAPNSHYEECSCYPDTGKVMCVCRDNWHGSNRPWVSFDQNLDYQIGYICSGVFGDNPRPKDGTGSCGPVYVDGANGVKGFSYRYGNGVWIGRTKSHSSRHGFEMIWDPNGWTETDSKFSVRQDVVAMTDWSGYSGSFVQHPELTGLDCIRPCFWVELIRGRPKEKTIWTSASSISFCGVNSDTVDWSWPDGAELPFTIDK\*

>mS hybrid (mSN1 Loops - PR8 Scaffold)

*MNTQILVFALIAIIPTNADKI*SAWSHPQFEKGGGGSHHHHHHSSSGSGAHIVMVDAYKPTKGGSGGGGSIINETADDIVYRLTVIIDDRYESLKNLITLRADRLEMIINDNVSTILAGGSGTGSVILTGNSSLCPIRGWAIYSKDNSIRIGSKGDVFVIREPFISCSHLECRTFFLTQGALLNDKHSNGTVKDRSPYRALMSCPVGEAPSPYNSRFESVAWSASACHDGMGWLTIGISGPDNGAVAVLKYNGIITETIKSWRNNILRTQESECACVNGSCFTIMTDGPSNGQASYKIFKIEKGKVTKSIELNAPNYHYEECSCYPDTGKVMCVCRDNWHGSNRPWVSFDQNLDYQIGYICSGVFGDNPRPNDGTGSCSPMSSNGAYGVKGFSYRYGNGVWIGRTKSTSSRSGFEMIWDPNGWTETDSKFSVRQDVVEITDWSGYSGSFVQHPELTGLDCIRPCFWVELIRGRPKENTIWTSASSISFCGVNSDTVDWSWPDGAELPFTIDK\*

>PR8 hybrid (PR8 N1 Loops - mSN1 Scaffold)

*MNTQILVFALIAIIPTNADKI*SAWSHPQFEKGGGGSHHHHHHSSSGSGAHIVMVDAYKPTKGGSGGGGSIINETADDIVYRLTVIIDDRYESLKNLITLRADRLEMIINDNVSTILAGGSGTGSVTLAGNSSLCPISGWAIYSKDNGIRIGSKGDVFVIREPFISCSHLECRTFFLTQGALLNDRHSNGTVKDRSPYRTLMSCPVGEAPSPYNSRFESVAWSASACHDGISWLTIGISGPDNGAVAVVKYNGIITDTIKSWRKKILRTQESECACVNGSCFTVMTDGPSDGLASYKIFKIEKGKVVKSVELNAPNSHYEECSCYPDAGDIMCVCRDNWHGSNRPWVSFNQNLEYQIGYICSGVFGDNPRPKDGTGSCGPVYVDGANGVKGFSFKYGNGVWIGRTKSHSSRHGFEMIWDPNGWTETDSSFSVKQDIVAMTDWSGYSGSFVQHPEMTGLDCMRPCFWVELIRGRPKEKTIWTSGSSISFCGVNSDTVGWSWPDGAELPFTIDK\*