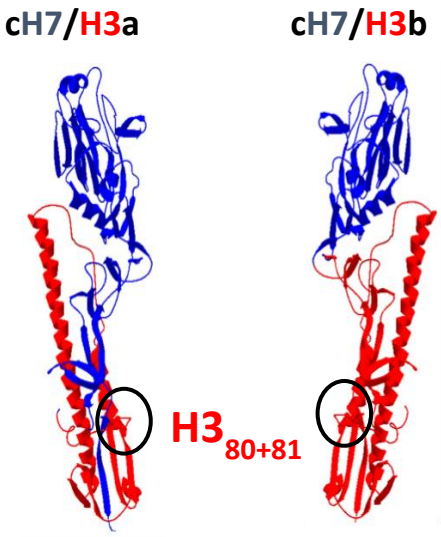

Figure S1: Structures of the chimera cH7/H3 protein:

Left panel: **cH7/H3a** encodes the entire HA1 domain (aa 1-293) from H7 (A/Anhui/1/13) and the entire HA2 domain (aa 294-576) from H3 (A/Perth/16/09). Recombinant protein was expressed in mammalian expression system (293 cells). When folded, the stem domain partially includes the C-Terminal extension from H7 (aa 227-293).

Right panel: **cH7/H3b** was engineered to make stem domain purely of H3 origin. **cH7/H3b** was engineered such that only the globular head (aa 69-227) was derived from H7 (A/Anhui/1/13) and the entire stem (aa 1-68, 228-293, 294-576) from H3 (A/Hong Kong/14) when folded. It was achieved by swapping N-terminal extension (aa 1-68) and C-terminal extension (aa 228-293) in H7 HA1 domain with homologous H3 regions. This alternative design was chosen because we speculated that this "matching" of sequence origin in the stalk region might lead to the most native conformation in the HA2 domain. Recombinant protein was generated in a baculovirus expression vector system as previously described (PMID: 22928001).

Both constructs were made in soluble form by eliminating the transmembrane and cytoplasmic domains and inserting foldon trimerization domain (PMID: 24501410, PMID: 22928001) that allowed multimeric assembly. Each construct also contained 6x histidine tags used for nickel column purification.