

Table S6. Molecular character of the HA gene.

strains	Q226L	G228S	158-160	324-332	98	138	153	183	190
	antigen-binding site	Antigen binding site	glycosylation site	Cleavage site	Key receptor binding sites				
G152	Q	G	GSS	PEKQTR ↑ GLF	Y	A	W	H	E
G155	Q	G	GNS	PEKQTR ↑ GLF	Y	A	W	H	E
G188	Q	G	GNS	PEKQTR ↑ GLF	Y	A	W	H	E
G630	Q	G	GNS	PEKQTR ↑ GLF	Y	A	W	H	E
H34	Q	G	GNS	PEKQTR ↑ GLF	Y	A	W	H	E
H140	Q	G	GNS	PEKQTR ↑ GLF	Y	A	W	H	E
H144	Q	G	GNS	PEKQTR ↑ GLF	Y	A	W	H	E
H151	Q	G	GNS	PEKQTR ↑ GLF	Y	A	W	H	E
H157	Q	G	GNS	PEKQTR ↑ GLF	Y	A	W	H	E
H159	Q	G	GNS	PEKQTR ↑ GLF	Y	A	W	H	E

Segment	Position	G152	G155	G188	G630	H34	H140	H144	H151	H157	H159	Mutation	Function
PB2	D253	D	D	D	D	D	D	D	D	D	D	D→N	Contributes to the Pathogenesis of the Virus in Mammalian Hosts(Jinfeng <i>et al.</i> , 2018)
	292	I	I	I	I	I	I	I	I	I	I	V→I	abolished the transmission of H7N9(Kong <i>et al.</i> , 2019)
	389	R	R	R	R	R	R	R	K	R	R	R→K	higher adaptability of AIVs in avians and mammals(Li <i>et al.</i> , 2022)
	588	A	A	A	A	A	S	S	A	S	S	A→S	promotes the mammalian adaptation (Xiao <i>et al.</i> , 2016)
	598	T	T	T	T	T	T	T	T	T	T	T→M	higher adaptability of AIVs in avians and mammals(Li <i>et al.</i> , 2022)
	627	E	E	E	E	E	E	E	E	E	E	K→E	abolished the transmission of H7N9(Kong <i>et al.</i> , 2019)
	701	D	D	D	D	D	D	D	D	D	D	D→N	Promote Adaptation of an Influenza H5N1 Virus to a Mammalian Host(Czudai-Matwich <i>et al.</i> , 2014)
	648	L	L	L	L	L	L	L	I	L	I	L→V	play critical roles in mammalian adaptation(Xiao <i>et al.</i> , 2016)
	676	T	T	T	T	T	T	T	T	T	T	T→M	play critical roles in mammalian adaptation(Xiao <i>et al.</i> , 2016)
	714	S	S	S	S	S	S	S	S	S	S	S→R	Promote Adaptation of an Influenza H5N1 Virus to a Mammalian Host(Czudai-Matwich <i>et al.</i> , 2014)

PB1	269	S	S	S	S	S	S	S	S	S	S	F→S	increase the replication or virulence of avian influenza viruses in mammalian hosts(Guan <i>et al.</i> , 2019)
	436	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y→H	Reduce the virus fit(Hulse-Post <i>et al.</i> , 2007)
	577	K	K	K	K	K	K	K	K	K	K	K→E	Increases Polymerase Activity and Pathogenicity in Mice(Kamiki <i>et al.</i> , 2018)
	G622	G	G	G	G	G	G	G	G	G	G	G→D	attenuating H5N1 virus virulence in mice(Feng <i>et al.</i> , 2016)
	677	T	T	T	T	T	T	T	T	T	T	M→T	increase the replication or virulence of avian influenza viruses in mammalian hosts(Guan <i>et al.</i> , 2019)
	26	E	E	E	E	E	E	E	E	E	E	E→K	attenuates virus replication and pathogenicity(Clements <i>et al.</i> , 2020)
	224	S	S	S	S	S	S	S	S	S	S	S→P	increased the replication of the virus(Song <i>et al.</i> , 2011)
	343	A	A	A	A	A	A	A	A	A	A	A→S	increased viral polymerase activity and mouse virulence(Zhong <i>et al.</i> , 2018)
PA	347	D	D	D	D	D	D	D	D	D	D	E→D	increased viral polymerase activity and mouse virulence(Zhong <i>et al.</i> , 2018)
	356	K	K	K	K	K	K	K	K	K	K	K→R	Increases Mammalian Replication and Pathogenicity(Xu <i>et al.</i> , 2016)
	383	D	D	D	D	D	D	D	D	D	D	N→D	increased the polymerase activity(Song <i>et al.</i> , 2011)

	515	T	T	T	T	T	T	T	T	T	T	T	T→A	converted a lethal virus to a nonlethal virus in ducks(Song <i>et al.</i> , 2011)
	672	L	L	L	L	L	L	L	L	L	L	L	F→L	important role for airborne transmissibility among chickens(Zhong <i>et al.</i> , 2014)
NP	286	A	A	A	A	A	A	A	A	A	A	A	A→V	Attenuate H7N9 Viruses in Mice(Ma <i>et al.</i> , 2020)
	357	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q→K	Determines the virulence phenotype in mice(Zhu <i>et al.</i> , 2019)
	437	T	T	T	T	T	T	T	T	T	T	T	T→M	Attenuate H7N9 Viruses in Mice(Ma <i>et al.</i> , 2020)
NA	274	H	H	H	H	H	H	H	H	H	H	H	H→Y	conferring resistance to oseltamivir(Weinstock <i>et al.</i> , 2003)
	294	N	N	N	N	N	N	N	N	N	N	N	N→S	confer resistance to neuraminidase inhibitors(Kiso <i>et al.</i> , 2004)
MP	M1-30	D	D	D	D	D	D	D	D	D	D	D	N→D	increase the replication or virulence in mammalian(Shufang <i>et al.</i> , 2008)
	M1-156	D	D	D	D	D	D	D	D	D	D	D	D→E	abolished the transmission of H7N9(Kong <i>et al.</i> , 2019)
	M1-215	A	A	A	A	A	A	A	A	A	A	A	T→A	increase the replication or virulence in mammalian(Shufang <i>et al.</i> , 2008)
	M2-31	S	S	N	S	S	S	S	S	S	S	S	S→N/D	increase the resistance to adamantane(He <i>et al.</i> , 2021)

NS	42	S	S	S	S	S	S	S	S	S	S	S	S→P	increased virulence in mice(Jiao <i>et al.</i> , 2008)
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