

# Country Report: Estonia

Worldwide Influenza Centre, WHO CC for Reference and Research on Influenza, The Francis Crick Institute, 1 Midland Road, NW1 1AT

September 2022 to July 2023



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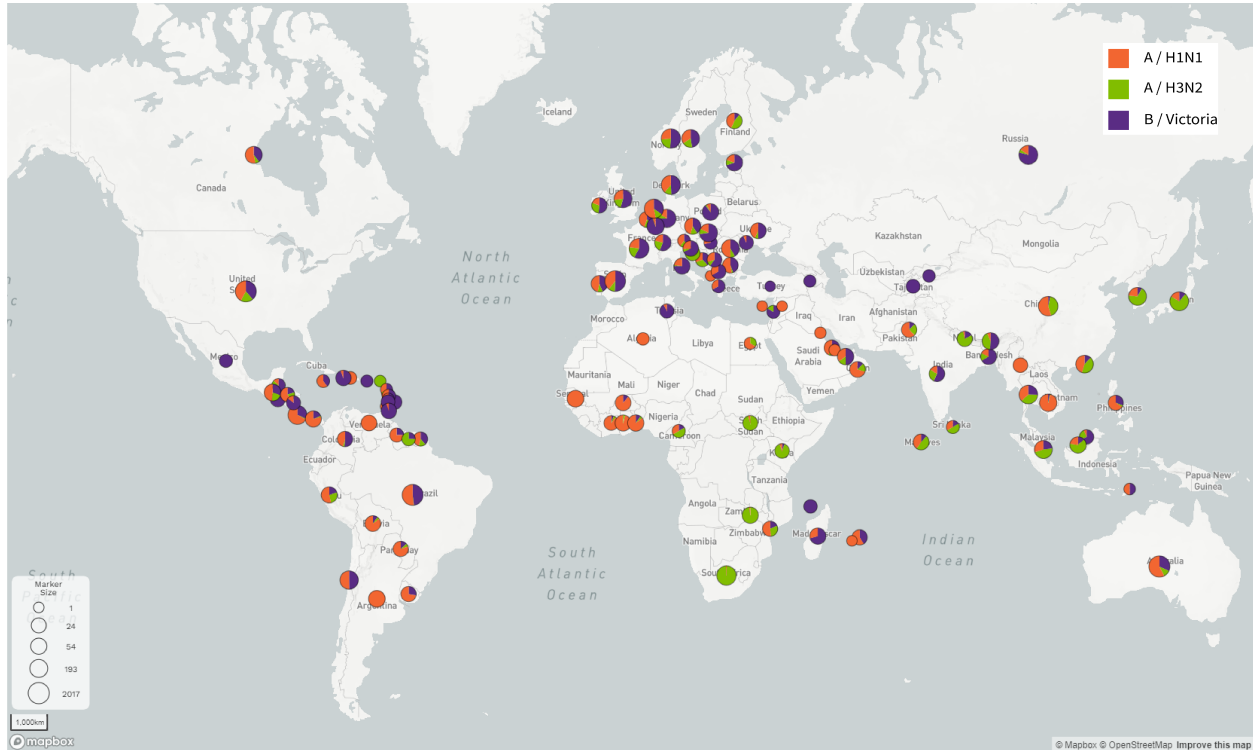
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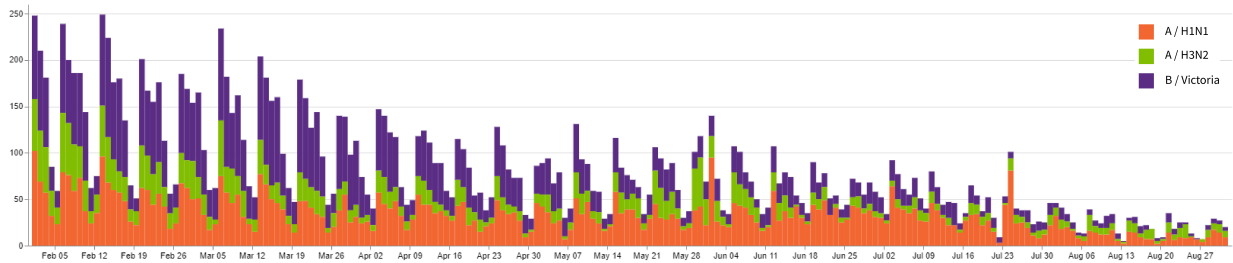
For more information about what we have observed over the last twelve months please see our reports for February 2023 and September 2023. All of our reports since 2003 are available at <https://www.crick.ac.uk/partnerships/worldwide-influenza-centre/annual-and-interim-reports>

## Influenza by type/subtype:

Geographical distribution of seasonal influenza viruses with collection dates from February 2023 through to September 2023 as deposited in GISAID, coloured by Type/subtype. Geographic markers scaled to detection proportions.

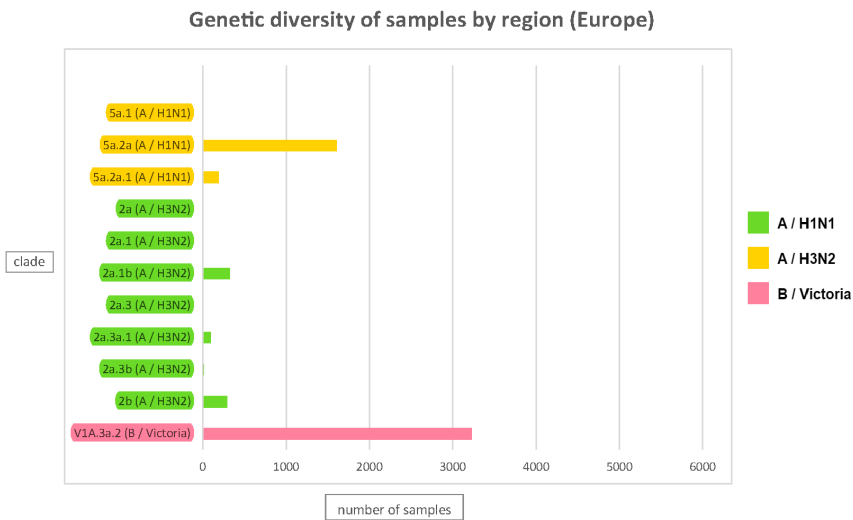
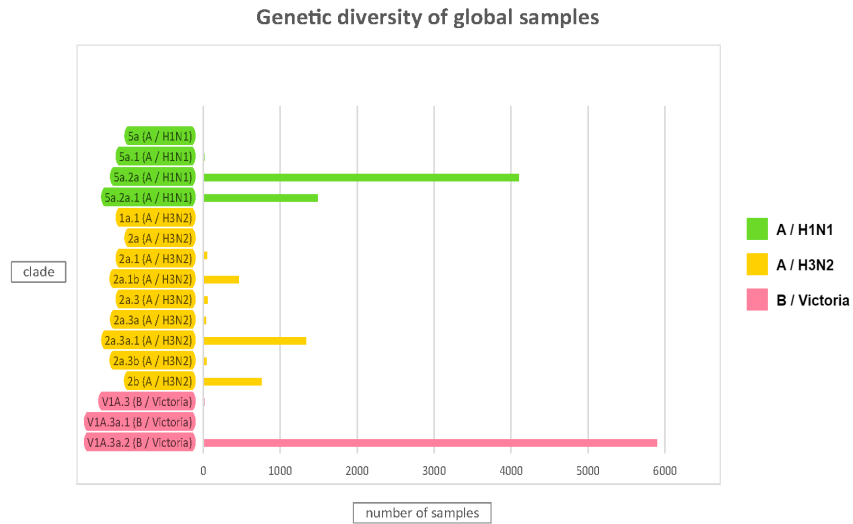


Globally, influenza detections declined through the reporting period. However the relative proportions of A/H1N1, A/H3N2 and B/Victoria varied by geographic region as indicated by the different colours in the pie charts by country.



## Genetic diversity:

Plots showing genetic diversity of A/H1N1, A/H3N2 and B/Victoria that underwent sequencing during the reporting period. A(global) B(WHO region)



## Phylogenetic analyses: A/H1N1



Globally 6B.1A.5a.2a and 6B.1A.5a.2a.1 clade viruses both continued to circulate with differing relative proportions depending on region.

Clade 5a.2a viruses predominated since 1st February in Africa, the Eastern Mediterranean, and South East Asia, albeit with few viruses detected.

In Europe, Western Pacific and the Americas both 5a.2a and 5a.2a.1 viruses were detected, with 5a.2a viruses being the larger proportion.

Within 5a.2a clade, A/Sydney/5/2021-like viruses were detected but in the minority. We note three subgroups; one detected in Australia and Europe, represented by A/Sydney/175/2022; a second detected in South East Asia (S83P, S85P, H273Q, V321I) and the other represented by A/Washington/22/2023 or A/Washington/24/2022 (A73T, A141E, V152I, S190I).

The larger 5a.2a group has split into three groups defined by the following references, with some additional amino acid substitutions: A/Maine/10/2022 -like (A48P), A/Netherlands/10468/2023-like (I418V, D269N, P137S) and the remaining group, without a potential CVV or reference, defined by I418V.

Within 5a.2a.1 clade (P137S, T277A, E356D) there are two main groups of viruses - either A/Wisconsin/67/2022-like or A/Victoria/4897/2022-like (with T216A).

**The majority of A/H1N1 virus HA sequences from Estonia clustered within clade 5a.2a, with a few sequences grouped within clade 5a.2a.1.**

### Maximum likelihood phylogenetic tree of the H1 HA gene

Maximum likelihood phylogenetic tree inferred using Iqtree2 from HA sequence data generated at the WIC. Annotation of amino acid substitutions was performed with Treetime ancestral reconstruction. References and CVVs are marked as Cell or Egg. Virus names are colored by collection month.

Vaccine viruses  
Reference viruses

Collection dates

Nov 2022  
Dec 2022  
Jan 2023  
Feb 2023  
Mar 2023  
Apr 2023  
May 2023  
Jun 2023



5a.2a

5a.2a.1

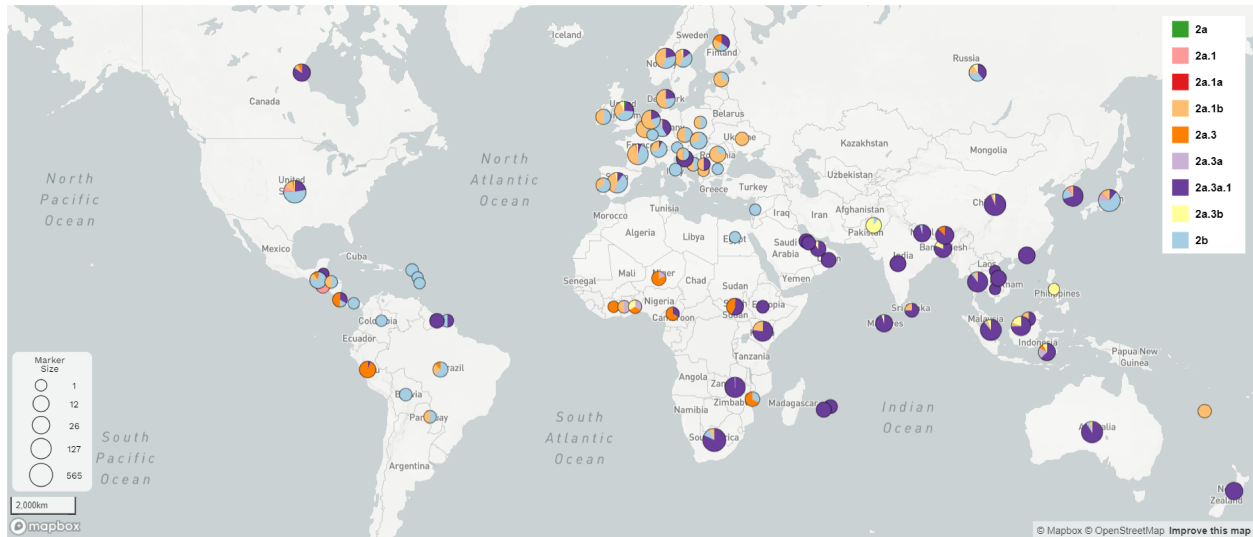
5a.2a

5a.1

5a.2

0.01

## Phylogenetic analyses: H3N2



Clade 3C.2a1b.2a.2 predominated since 1st February in all geographic regions where H3N2 circulated. We observed continued co-circulation of multiple genetic clades - however **2a.1b**, **2a.3a.1** and **2b** clades were the most frequently detected.

Viruses from clade 2b (E50K, F79V, I140K) are split into three subclades: one with I242M; a second represented by A/Florida/50/2022, A/Puerto Rico/31/2022 as potential CVVs; and a third subclade (S262N) with two groups: viruses from Europe and Japan (R33Q) and viruses from Europe represented by A/Montana/08/2023 (T135A with potential loss of glycosylation).

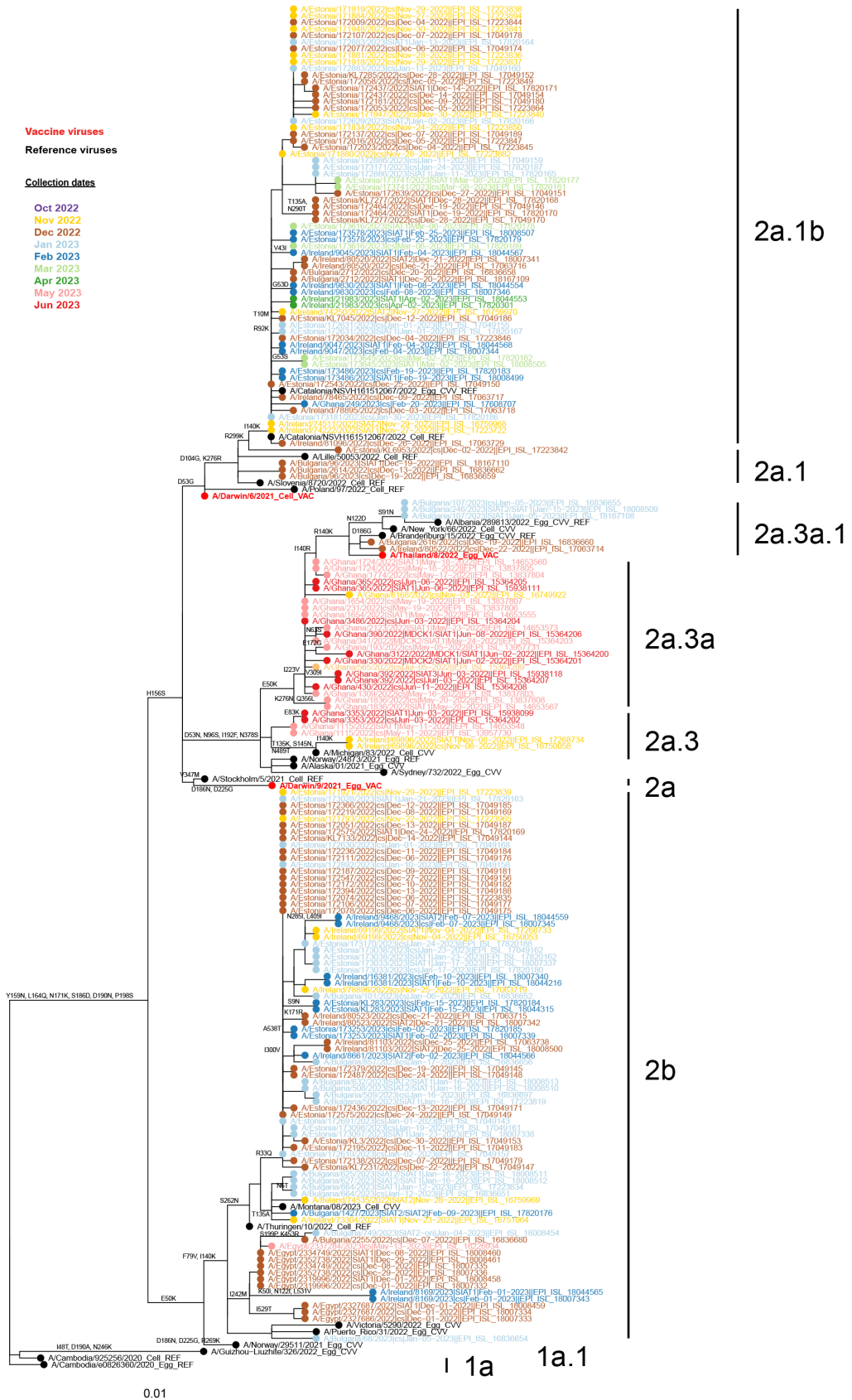
Viruses from clade 2a.1b (I140K, R299K) were detected in Europe and South Africa, represented by A/Catalonia/NSVH161512067/2022.

Clade 2a.3a.1 viruses were detected worldwide, characterised by I140K with a subclade showing N122D (loss of glycosylation), represented by A/New York/66/2022 and another subclade with I25V, V347M, I418V, detected in China and the US.

**A/H3N2 virus HA sequences from Estonia clustered in similar proportions within clades 2b and 2a.1b.**

### Maximum likelihood phylogenetic tree of the H3 HA gene.

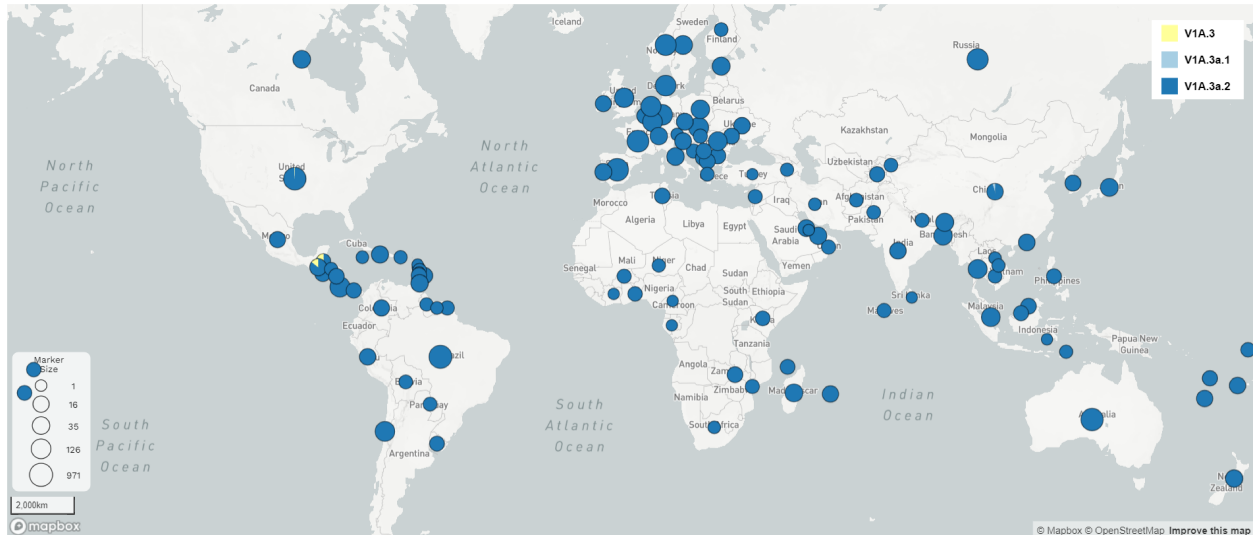
Maximum likelihood phylogenetic tree inferred using Iqtree2 from HA sequence data generated at the WIC. Annotation of amino acids substitutions was performed with Treetime ancestral reconstruction. References and CVVs are marked as Cell or Egg. Virus names are colored by collection month.



## Phylogenetic analyses:

### Influenza B viruses

#### B/Victoria lineage



Clade V1A.3a.2 viruses predominated since 1st February 2023 in geographic regions where B/Victoria-lineage viruses were detected.

No Clade V1A.3 viruses were detected since 1st February 2023.

**All B/Victoria lineage HA sequences from Estonia grouped within clade V1A.3a.2.**

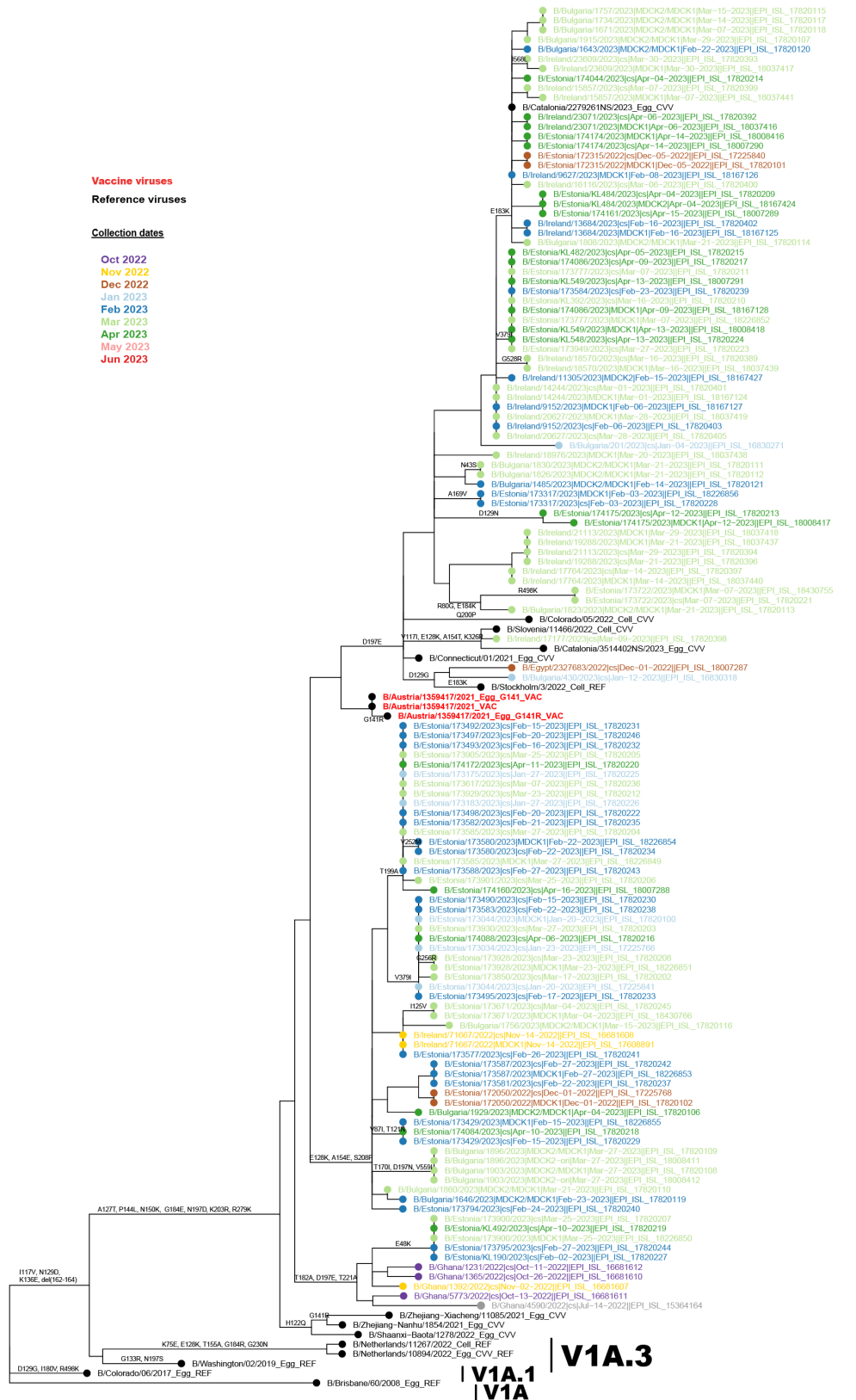
#### B/Yamagata lineage

No B/Yamagata lineage viruses have been detected since March 2020.

#### Maximum likelihood phylogenetic tree of the B/Victoria lineage HA gene

Maximum likelihood phylogenetic tree inferred using Iqtree2 from HA sequence data generated at the WIC. Annotation of amino acid substitutions was performed with Treetime ancestral reconstruction. References and CVVs are marked as Cell or Egg. Virus names are colored by collection month.





V1A.3a.2

## Phenotypic analyses

Haemagglutination inhibition (HI) assay data: ferret antisera raised against vaccine recommendations

### H1 Summary

Some HI titre fold reductions were observed against the SH2023 vaccine strain (A/Sydney/5/21 cell 5a.2a), especially when test viruses are 5a.2a.1, whereas the cell based NH 2023-24 cell based strain (A/Victoria/4897/2022) recognises both 5a.2a and 5a.2a.1 well.

Egg-based A/Victoria/4897/2022 recognises both 5a.2a and 5a.2a.1 test viruses well.

### H3 Summary

For clade 2a.2 viruses we observed that, where we have titrations, the post-infection antisera raised against new reference viruses discriminated antigenic properties among the different genetic subgroups.

In HI assays, the egg-based A/Darwin/9/21 vaccine strain is showing reduced recognition of 2a.1b and 2a.3a.1 groups and a more dramatic loss in recognition for test viruses in the 2b clade.

In MN assay the egg based A/Darwin/9/21 vaccine strain is showing significantly reduced recognition to all other clades of test viruses.

A/Albania/289813/2022 (2a.3a.1) shows good recognition of test viruses in its own clade, but this antiserum does not recognise viruses in clade 2b at all.

A/Slovenia/8720/2022 (2a.1) shows good recognition of 2a.1b and 2a.3a.1 viruses, with some lower recognition of 2b viruses.

### Influenza B summary

B/Victoria lineage: All V1A.3a.2 viruses tested were well-recognised by antisera raised against B/Austria/1359417/2021 vaccine virus.

## Antiviral susceptibility

All tested viruses were susceptible to neuraminidase inhibitors (NAI) by phenotypic testing and no genetic markers for reduced inhibition by NAIs were identified in NA sequences derived from clinical specimens.

For all viruses where PA gene sequencing was successful, no markers associated with reduced inhibition by baloxavir marboxil were identified.

# HI Tables: H1

Table H1-10. Antigenic analyses of influenza A(H1N1)pdm09 viruses (2023-05-23)

Viruses	Other information	Collection date	Passage history	Haemagglutination inhibition titre											
				Post-infection ferret antiserum											
				A/G-M	A/G-M	A/Ghana	A/Lyon	A/Denmark	IVR-215	A/Sydney	A/Sydney	A/Norway	A/Norway/	A/Victoria/	IVR-238
				SWL1536/19	SWL1536/19	1894/21	820/21	3280/19	A/Vic/2570/19	5/21	5/21	25089/22	31694/2022	4897/2022	A/Vic/4897/22
				MDCK	Egg	Egg	Egg	MDCK	Egg	MDCK	Egg	MDCK	Egg	MDCK	Egg
	Passage history			F09/20	F12/20	F02/22	F08/22	F28/20	F37/21	F46/22	F04/22	F38/22	F48/22	F05/23	F07/23
	Ferret number														
	Genetic group			5a.1	5a.1	5a.1	5a.1	5a.2	5a.2	5a.2a	5a.2a	5a.2a.1	5a.2a.1	5a.2a.1	5a.2a.1
<b>REFERENCE VIRUSES</b>															
A/Guangdong-Maonan/SWL1536/2019	5a.1	2019-06-17	C2/MDCK1	2560	1280	640	320	40	<40	<40	40	40	<40	<40	80
A/Guangdong-Maonan/SWL1536/2019	5a.1	2019-06-17	E3/E2	640	640	640	320	<40	40	<40	<40	<40	<40	<40	40
A/Ghana/1894/2021	5a.1	2021-07-21	E2/E1	2560	1280	640	160	40	80	40	40	40	<40	<40	80
A/Lyon/820/2021	5a.1	2021-11-16	E1/E2	320	160	160	320	40	40	<40	<40	<40	<40	<40	160
A/Denmark/3280/2019	5a.2	2019-11-10	MDCK4/MDCK6	40	40	<40	40	1280	1280	640	1280	1280	320	1280	640
IVR-215 (A/Victoria/2570/2019)	5a.2	2018-11-22	E4/D7/E2	160	80	40	80	640	1280	640	640	640	320	640	1280
A/Sydney/5/2021 clone 3.4.1	5a.2a	2021-10-16	MDCK3/MDCK3	40	40	<40	<40	1280	1280	1280	1280	1280	640	1280	1280
A/Sydney/5/2021 pooled clones 10-10	5a.2a	2022-10-31	E3/E3	80	80	40	40	640	1280	1280	1280	1280	320	1280	2560
A/Norway/25089/2022	5a.2a.1	2022-06-15	MDCK3	<40	<40	<40	<40	640	640	640	640	1280	640	1280	1280
A/Norway/31694/2022	5a.2a.1	2022-09-24	E3/E1 10-3	<40	<40	<40	<40	320	640	320	640	640	320	1280	640
A/Victoria/4897/2022	5a.2a.1	2022-10-02	SIAT2/MDCK2	40	<40	<40	<40	1280	1280	1280	1280	2560	1280	2560	1280
IVR-238 (A/Victoria/4897/2022)	5a.2a.1	2022-10-02	E3/D6/E1 10-6	80	80	40	80	1280	1280	1280	1280	1280	640	1280	2560
<b>TEST VIRUSES</b>															
A/Antsirabe/07452/2022	5a.2a	2022-12-05	MDCK1	40	40	<40	<40	640	640	640	640	640	320	1280	640
A/Lisboa/756/2022	5a.2a	2022-12-19	MDCK1	40	40	<40	<40	640	1280	1280	1280	1280	640	1280	1280
A/Antsirabe/07646/2022	5a.2a	2022-12-19	MDCK1	40	40	<40	<40	320	640	640	640	640	320	640	640
A/MountLebanon/2884/2022	5a.2a	2022-12-20	MDCK1	40	40	<40	<40	1280	1280	1280	1280	1280	640	1280	1280
A/Albania/290498/2023	5a.2a	2023-01-04	MDCK3	40	40	<40	<40	640	640	640	1280	1280	320	1280	1280
A/Albania/290464/2023	5a.2a	2023-01-04	MDCK2	80	40	<40	<40	1280	2560	1280	2560	1280	640	2560	2560
A/North Lebanon/S0043/2023	5a.2a	2023-01-04	MDCK1	40	40	<40	<40	640	1280	1280	1280	640	320	640	1280
A/Montenegro/102793/2023	5a.2a	2023-01-10	MDCK1	80	80	<40	<40	1280	1280	2560	2560	1280	640	2560	2560
A/North Lebanon/S0063/2023	5a.2a	2023-01-11	MDCK1	40	<40	<40	<40	320	640	320	640	320	160	640	640
A/Estonia/KL262/2023	5a.2a	2023-02-14	MDCK1	40	40	<40	<40	640	1280	640	1280	640	320	1280	1280
A/Estonia/173456/2023	5a.2a	2023-02-14	MDCK1	40	40	<40	<40	640	640	640	1280	640	320	640	1280
A/Estonia/173432/2023	5a.2a	2023-02-14	MDCK1	40	40	<40	<40	640	1280	640	1280	640	320	1280	1280
A/Estonia/173557/2023	5a.2a	2023-02-21	MDCK1	40	<40	<40	<40	320	640	320	640	320	320	640	640
A/Estonia/173652/2023	5a.2a	2023-03-02	MDCK1	40	40	<40	<40	1280	1280	1280	2560	1280	640	1280	2560
A/Estonia/173780/2023	5a.2a	2023-03-07	MDCK1	40	40	<40	<40	640	1280	1280	1280	640	320	1280	1280
A/Slovenia/812/2023	5a.2a	2023-03-13	MDCK10/MDCK1	40	40	<40	<40	640	640	640	640	640	320	640	640
A/Slovenia/836/2023	5a.2a	2023-03-15	MDCK10/MDCK1	40	40	40	40	640	1280	1280	1280	640	320	1280	640
A/Estonia/174171/2023	5a.2a	2023-04-14	MDCK1	40	40	<40	<40	640	1280	640	1280	640	320	1280	2560
A/Albania/290245/2022	5a.2a		MDCK3	<40	<40	<40	<40	80	160	160	320	320	160	320	320
A/Ireland/79395/2022	5a.2a.1	2022-12-17	MDCK3	<40	<40	<40	<40	160	320	160	160	320	160	640	160
A/Lisboa/733/2022	5a.2a.1		MDCK1	<40	<40	<40	<40	640	640	640	1280	1280	640	1280	640

< relates to the lowest dilution of antiserum used  
 ND = Not Done

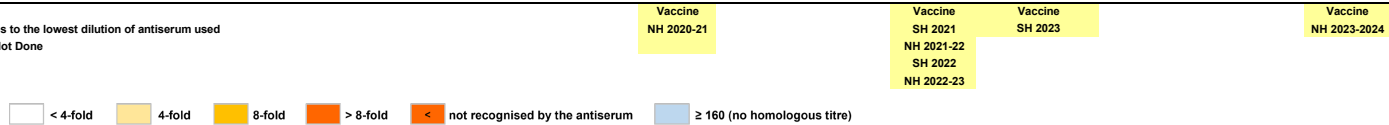




Table H1-17. Antigenic analyses of influenza A(H1N1)pdm09 viruses (2023-07-25)

Viruses	Other information	Collection date	Passage history	A/G-M	IVR-215	A/Sydney	A/Sydney	A/Victoria/	IVR-238	A/Wisconsin/
				SWL1536/19	A/Vic/2570/19	5/21	5/21	4897/2022	A/Vic/4897/22	67/2022
	Passage history			Egg	Egg	MDCK	Egg	MDCK	Egg	MDCK
	Ferret number			F12/20	F37/21	F46/22	F04/22	F05/23	F07/23	F17/23
	Genetic group			5a.1	5a.2	5a.2a	5a.2a	5a.2a.1	5a.2a.1	5a.2a.1
<b>REFERENCE VIRUSES</b>										
A/Guangdong-Maonan/SWL1536/2019	5a.1	2019-06-17	E3/E2	1280	40	<40	40	<40	40	<40
IVR-215 (A/Victoria/2570/2019)	5a.2	2018-11-22	E4/D7/E2	80	1280	640	640	640	1280	320
A/Sydney/5/2021 clone 3.4.1	5a.2a	2021-10-16	MDCK3/MDCK3	80	1280	1280	1280	1280	1280	1280
A/Sydney/5/2021 pooled clones 10-10	5a.2a	2022-10-31	E3/E3	80	1280	1280	1280	1280	2560	640
A/Victoria/4897/2022	5a.2a.1	2022-10-02	SIAT2/MDCK2	40	1280	1280	1280	2560	1280	1280
IVR-238 (A/Victoria/4897/2022)	5a.2a.1	2022-10-02	E3/D6/E1 10-6	40	1280	1280	2560	2560	2560	640
A/Wisconsin/67/2022	5a.2a.1	2022-10-25	MDCK2	40	640	640	1280	2560	1280	1280
<b>TEST VIRUSES</b>										
A/Hungary/37/2023	5a.2a	2023-01-26	MDCK1/MDCK1	40	1280	1280	1280	1280	1280	640
A/Hungary/34/2023	5a.2a	2023-01-30	MDCK1/MDCK1	40	1280	640	1280	640	1280	640
A/Norway/1811/2023	5a.2a	2023-01-31	MDCK2	40	1280	1280	1280	1280	1280	640
A/Estonia/173320/2023	5a.2a	2023-02-05	MDCK1	40	1280	1280	1280	1280	1280	640
A/Estonia/173321/2023	5a.2a	2023-02-07	MDCK1	40	1280	1280	1280	1280	1280	640
A/Hungary/66/2023	5a.2a	2023-02-20	MDCK1/MDCK1	80	2560	1280	2560	2560	2560	1280
A/Ireland/15762/2023	5a.2a	2023-03-06	MDCK2	40	1280	1280	2560	2560	1280	640
A/Ireland/16836/2023	5a.2a	2023-03-09	MDCK2	80	1280	1280	2560	2560	2560	1280
A/Ireland/16739/2023	5a.2a	2023-03-10	MDCK2	40	1280	1280	1280	1280	1280	640
A/Hungary/116/2023	5a.2a	2023-03-29	MDCK1/MDCK1	80	2560	1280	2560	2560	2560	1280
A/Serbia/2737/2023	5a.2a	2023-03-29	C2/MDCK1	40	640	640	640	640	640	320
				Vaccine	Vaccine	Vaccine		Vaccine	Vaccine	
				NH 2020-21	SH 2021	SH 2023		NH 2023-24	NH 2023-24	
					NH 2021-22					
					SH 2022					
					NH 2022-23					

< relates to the lowest dilution of antiserum used  
 ND = Not Done

< 4-fold  
  4-fold  
  8-fold  
  > 8-fold  
  < not recognised by the antiserum  
  ≥ 160 (no homologous titre)

Table H1-18. Antigenic analyses of influenza A(H1N1)pdm09 viruses (2023-08-01)

NEW

Viruses	Other information	Collection date	Passage history	A/G-M	IVR-215	A/Sydney	A/Sydney	A/Victoria/	A/Victoria/	IVR-238	A/Wisconsin/
				SWL1536/19	A/Vic/2570/19	5/21	5/21	4897/2022	4897/2022	A/Vic/4897/22	67/2022
				Egg	Egg	MDCK	Egg	MDCK	MDCK	Egg	MDCK
				F12/20	F37/21	F46/22	F04/22	F05/23	F22/23	F07/23	F17/23
				5a.1	5a.2	5a.2a	5a.2a	5a.2a.1	5a.2a.1	5a.2a.1	5a.2a.1
				Genetic group							
<b>REFERENCE VIRUSES</b>											
A/Guangdong-Maonan/SWL1536/2019	5a.1	2019-06-17	E3/E2	1280	80	<40	<40	<40	<40	40	<40
IVR-215 (A/Victoria/2570/2019)	5a.2	2018-11-22	E4/D7/E2	80	1280	640	640	640	640	640	320
A/Sydney/5/2021 clone 3.4.1	5a.2a	2021-10-16	MDCK3/MDCK3	40	1280	640	1280	1280	640	1280	640
A/Sydney/5/2021 pooled clones 10-10	5a.2a	2022-10-31	E3/E2	40	640	640	1280	640	320	1280	320
A/Victoria/4897/2022	5a.2a.1	2022-10-02	SIAT2/MDCK2	40	1280	1280	2560	2560	2560	1280	2560
IVR-238 (A/Victoria/4897/2022)	5a.2a.1	2022-10-02	E3/D6/E1 10-6	40	640	640	1280	2560	640	2560	640
A/Wisconsin/67/2022	5a.2a.1	2022-10-25	MDCK2	40	1280	640	1280	2560	1280	1280	1280
<b>TEST VIRUSES</b>											
A/Parma/11/2023	5a.2a	2023-01-27	MDCK3/MDCK1	<40	640	320	320	320	320	640	320
A/Parma/14/2023	5a.2a	2023-01-31	MDCK3/MDCK1	<40	640	320	640	640	320	640	640
A/FVG-Trieste/114/2023	5a.2a	2023-02-03	MDCK3/MDCK1	<40	640	320	640	640	320	640	320
A/FVG-Genzia/113/2023	5a.2a	2023-02-03	MDCK3/MDCK1	<40	640	640	640	640	320	640	320
A/FVG-Trieste/116/2023	5a.2a	2023-02-07	MDCK3/MDCK1	<40	1280	1280	1280	1280	1280	1280	640
A/FVG-Trieste/115/2023	5a.2a	2023-02-07	MDCK3/MDCK1	<40	1280	640	640	640	320	640	320
A/Estonia/173338/2023	5a.2a	2023-02-09	MDCK2	<40	1280	640	1280	640	640	1280	320
A/Belgium/S1341/2023	5a.2a	2023-02-09	MDCK1/MDCK1	<40	2560	1280	2560	1280	640	1280	640
A/Belgium/S1330/2023	5a.2a	2023-02-12	MDCK1/MDCK1	<40	1280	640	1280	640	640	1280	320
A/Belgium/G0207/2023	5a.2a	2023-02-13	MDCK1/MDCK1	<40	1280	640	1280	1280	640	640	640
A/Belgium/S1391/2023	5a.2a	2023-02-16	MDCK1/MDCK1	<40	1280	1280	640	640	640	640	640
A/Belgium/S1354/2023	5a.2a	2023-02-17	MDCK1/MDCK1	<40	1280	640	1280	1280	640	640	640
A/Belgium/S1785/2023	5a.2a	2023-02-19	MDCK1/MDCK1	<40	640	640	1280	1280	640	1280	640
A/Belgium/G0248/2023	5a.2a	2023-03-06	MDCK1/MDCK1	<40	1280	1280	1280	1280	1280	1280	640
A/Kyiv/1996/2023	5a.2a	2023-03-10	MDCK3/MDCK1	<40	2560	2560	2560	2560	1280	2560	1280
A/Serbia/2349/2023	5a.2a	2023-03-14	C1/MDCK1	<40	1280	1280	1280	1280	640	1280	640
A/Belgium/S1403/2023	5a.2a	2023-03-14	MDCK1/MDCK1	<40	1280	640	640	640	640	640	640
A/Belgium/S1363/2023	5a.2a	2023-03-14	MDCK1/MDCK1	<40	1280	1280	1280	2560	1280	1280	640
A/Belgium/S1357/2023	5a.2a	2023-03-14	MDCK1/MDCK1	<40	2560	1280	2560	2560	1280	1280	1280
A/Belgium/S1336/2023	5a.2a	2023-03-14	MDCK1/MDCK1	<40	1280	1280	1280	1280	1280	1280	640
A/Belgium/S1333/2023	5a.2a	2023-03-14	MDCK1/MDCK1	<40	640	640	640	640	640	640	320
A/Belgium/S1331/2023	5a.2a	2023-03-14	MDCK1/MDCK1	<40	1280	1280	1280	1280	640	1280	640
A/Belgium/G0310/2023	5a.2a	2023-04-04	MDCK1/MDCK1	<40	2560	1280	2560	2560	1280	1280	1280
A/Belgium/G0316/2023	5a.2a	2023-04-06	MDCK1/MDCK1	<40	1280	1280	1280	1280	640	1280	640
A/Belgium/S1188/2023	5a.2a.1	2023-02-08	MDCK1/MDCK1	<40	640	640	640	1280	1280	640	640
A/Belgium/S1332/2023	5a.2a.1	2023-02-12	MDCK1/MDCK1	<40	1280	640	640	1280	1280	640	640

< relates to the lowest dilution of antiserum used

ND = Not Done

< 4-fold
4-fold
8-fold
> 8-fold
< not recognised by the antiserum
 ≥ 160 (no homologous titre)

Vaccine NH 2020-21
Vaccine SH 2021
Vaccine SH 2023
Vaccine NH 2023-24

NH 2021-22

SH 2022

NH 2022-23

Table H1-19. Antigenic analyses of influenza A(H1N1)pdm09 viruses (2023-08-08)

Viruses	Other information	Collection date	Passage history	Antigenic analysis											
				A/G-M BWL1536/19		IVR-215 A/Vic/2870/19		A/Sydney S/21		A/Victoria 4897/2022		IVR-238 A/Vic/4897/22		A/Wisconsin 67/2022	
				Egg F12/20	Egg F37/21	Egg F46/22	MDCk F04/22	Egg F05/23	MDCk F07/23	Egg F07/23	MDCk F17/23	Egg F07/23	MDCk F17/23		
<b>REFERENCE VIRUSES</b>				80	80	80	80	80	80	80	80	80	80	80	80
<b>TEST VIRUSES</b>				80	80	80	80	80	80	80	80	80	80	80	80
A/Guangdong/Minnon/01/16/2019	5a.1	2019-06-17	E3E2	1200	80	<40	<40	<40	<40	40	<40	40	<40	<40	
IVR-215 (A/Victoria/2670/2019)	5a.2	2016-11-22	E4D7E2	80	1200	320	640	640	640	640	640	640	640	640	
A/Sydney/05/2021 clone 3-4-1	5a.2a	2021-10-16	MDCk3MDCk3	80	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	
A/Sydney/05/2021 pooled clones 10-10	5a.2a	2022-10-31	E3E2	40	640	640	640	640	640	640	640	640	640	640	
A/Victoria/4897/2022	5a.2a.1	2022-10-02	SIAT2MDCk2	80	1200	1200	2600	2600	2600	2600	2600	2600	2600	2600	
IVR-238 (A/Victoria/4897/2022)	5a.2a.1	2022-10-02	E3D6E1 10-6	40	640	640	1200	1200	1200	1200	1200	1200	1200	640	
A/Wisconsin/67/2022	5a.2a.1	2022-10-25	MDCk2	40	1200	640	1200	1200	1200	1200	640	1200	1200	1200	

< relates to the lowest dilution of antiserum used  
 ND = Not Done

Vaccine NH 2020-21  
 Vaccine SH 2021  
 Vaccine SH 2022  
 Vaccine NH 2023-24

< 4-fold    4-fold    8-fold    > 8-fold    \* not recognised by the antiserum    ≥ 160 (no homologous titre)

# HI Tables: H3

Table H3-11. Antigenic analyses of influenza A(H3N2) viruses (Guinea Pig RBC with 20nM Oseltamivir) 2023-05-26

Viruses	Passage history Ferret number Genetic group	Collection date	Passage history	Haemagglutination inhibition titre										
				Post-infection ferret antisera										
				A/Camb 925256/20 SIAT F03/21 1a	A/Camb e0826360/20 Egg F10/21 1a	A/Thuringen 10/22 SIAT F36/22 2b	A/Stockholm 5/21 SIAT F15/22 2a	A/Darwin 9/21 SIAT F39/21 2a	A/Norway 24873/21 SIAT Egg F10/22 2a.3	A/Norway 24873/21 SIAT Egg F11/22 2a.3	A/Poland 97/22 SIAT F39/22 2a.2	A/Slovenia 8720/22 SIAT F24/22 2a.1	A/Lille 50053/22 SIAT F02/23 2a.1	A/Catal NSVH-2067/22 SIAT F41/22 2a.1b
<b>REFERENCE VIRUSES</b>														
A/Cambodia/925256/2020	1a	2020-09-25	SIAT5	640	320	40	160	320	80	80	160	<40	160	40
A/Cambodia/e0826360/2020	1a	2020-07-16	E5/E2	160	1280	80	160	320	80	80	40	160	320	40
A/Thuringen/10/2022	2b	2022-04-01	P1/SIAT2	160	320	640	640	640	160	320	160	640	640	160
A/Stockholm/50/2021	2a	2021-04-16	SIAT0/SIAT4	160	160	160	640	1280	160	320	640	1280	640	320
A/Darwin/9/2021	2a	2021-04-17	E5/E2	80	640	160	640	640	160	320	320	640	640	160
A/Norway/24873/2021	2a.3	2021-10-24	SIAT3	160	160	160	320	320	160	320	160	640	320	320
A/Norway/24873/2021	2a.3	2021-10-24	E3/E1	160	320	320	640	640	640	640	320	640	640	320
A/Poland/97/2022	2a.2	2022-05-09	SIAT3	80	160	160	640	640	160	320	1200	640	1280	640
A/Slovenia/8720/2022	2a.1	2022-02-10	SIAT1/MDCK1/SIAT2	160	160	160	640	1280	320	640	640	1280	1280	1280
A/Lille/50053/2022	2a.1	2022-09-06	MDCK1/SIAT5	80	160	80	320	640	80	160	320	640	2560	320
A/Catalonia/NSVH161512067/2022	2a.1b	2022-09-14	SIAT1/SIAT3	80	80	160	320	640	160	160	640	1280	1280	640
<b>TEST VIRUSES</b>														
A/Georgia/118-45/2022	2a.1b	2022-11-28	SIAT1	80	80	160	160	320	80	160	320	640	640	320
A/Georgia/126-26/2022	2a.1b	2022-12-05	SIAT1	80	160	80	160	320	80	160	320	640	2560	640
A/Estonia/172437/2022	2a.1b	2022-12-14	SIAT1	40	80	80	160	320	80	160	160	640	640	320
A/Estonia/172464/2022	2a.1b	2022-12-19	SIAT1	80	160	80	160	320	80	160	320	640	1280	640
A/Estonia/KL1271/2022	2a.1b	2022-12-29	SIAT1	80	160	80	320	320	80	160	320	640	1280	640
A/Estonia/172631/2023	2a.1b	2023-01-01	SIAT1	80	80	160	320	320	80	160	320	640	640	320
A/Slovenia/125/2023	2a.1b	2023-01-09	MDCK0/SIAT1	80	80	160	160	640	80	160	320	640	640	320
A/Slovenia/110/2023	2a.1b	2023-01-09	SIAT0/SIAT1	80	80	160	320	640	80	160	320	640	1280	640
A/Estonia/172896/2023	2a.1b	2023-01-11	SIAT1	40	80	160	320	640	80	160	320	1280	1280	640
A/Slovenia/158/2023	2a.1b	2023-01-11	MDCK0/SIAT1	80	160	160	320	640	160	160	320	640	640	320
A/Serbia/263/2023	2a.1b	2023-01-12	SIAT1	80	160	160	320	640	160	320	640	1280	1280	640
A/Estonia/172883/2023	2a.1b	2023-01-13	SIAT1	80	160	160	320	640	160	320	640	1280	1280	640
A/Slovenia/277/2023	2a.1b	2023-01-20	MDCK0/SIAT1	80	80	160	320	640	80	160	320	640	640	320
A/Estonia/173486/2023	2a.1b	2023-02-19	SIAT1	40	80	80	320	320	80	160	320	640	320	320
A/Estonia/173578/2023	2a.1b	2023-02-25	SIAT1	80	80	80	160	320	80	160	160	320	320	160
A/Slovenia/657/2023	2a.1b	2023-03-01	MDCK0/SIAT1	80	80	160	320	640	80	160	320	640	640	320
A/Estonia/173645/2023	2a.1b	2023-03-02	SIAT1	40	160	160	320	640	160	320	320	640	640	320
A/Estonia/173616/2023	2a.1b	2023-03-06	SIAT1	40	80	80	320	320	80	160	320	320	320	160
A/Estonia/173741/2023	2a.1b	2023-03-08	SIAT1	40	80	160	160	320	80	160	320	320	320	160
A/Togo/2082/2022	2a.3a	2022-10-06	SIAT1	80	320	320	640	640	320	640	320	640	640	160
A/Ireland/0052/2022	2a.3a.1	2022-12-22	SIAT3	40	160	160	160	320	160	640	160	320	320	160
A/Serbia/500898/2023	2a.3a.1	2023-01-06	SIAT1	40	160	160	320	640	320	640	160	320	320	160
A/Bulgaria/246/2023	2a.3a.1	2023-01-15	SIAT2/SIAT1	80	320	320	320	640	320	640	320	640	640	160
A/Serbia/7028/2022	2b	2022-12-23	SIAT1	80	160	320	320	320	80	160	80	320	160	80
A/Estonia/172575/2022	2b	2022-12-24	SIAT1	160	320	640	320	320	160	160	160	320	320	80
A/Ireland/81103/2022	2b	2022-12-28	SIAT3	80	160	320	320	320	80	160	160	320	320	80
A/Serbia/3/2023	2b	2023-01-02	SIAT1	80	160	320	320	320	80	80	160	640	640	40
A/Macedonia/1133/2023	2b	2023-01-09	SIAT1	80	160	320	320	320	80	160	80	320	320	80
A/Macedonia/113/2023	2b	2023-01-11	SIAT1	80	160	320	320	320	80	80	160	320	640	80
A/Serbia/501681/2023	2b	2023-01-12	SIAT1	80	320	320	320	320	80	160	160	320	640	80
A/Bulgaria/632/2023	2b	2023-01-16	SIAT2/SIAT1	160	320	640	640	640	320	320	160	640	640	160
A/Bulgaria/627/2023	2b	2023-01-16	SIAT2/SIAT1	80	320	320	320	320	160	160	160	320	1280	80
A/Bulgaria/625/2023	2b	2023-01-16	SIAT2/SIAT1	80	160	320	320	320	80	80	80	160	640	40
A/Bulgaria/508/2023	2b	2023-01-16	SIAT2/SIAT1	160	320	640	320	640	160	320	160	320	320	80
A/Estonia/173033/2023	2b	2023-01-17	SIAT1	80	160	320	320	320	160	160	160	320	320	80
A/Estonia/173028/2023	2b	2023-01-21	SIAT1	160	320	640	320	640	160	320	160	640	320	80
A/Estonia/173038/2023	2b	2023-01-23	SIAT1	160	320	320	320	320	160	160	160	320	320	80
A/Estonia/173097/2023	2b	2023-01-23	SIAT1	80	160	320	320	320	80	160	80	320	160	80
A/Estonia/173253/2023	2b	2023-02-02	SIAT1	80	160	320	320	320	160	160	80	320	320	80
A/Bulgaria/1427/2023	2b	2023-02-09	SIAT2/SIAT2	80	160	320	320	320	160	160	160	320	640	40
A/Estonia/KL293/2023	2b	2023-02-15	SIAT1	80	160	320	320	320	80	160	80	320	160	80
A/Slovenia/526/2023	2b	2023-02-17	SIAT0/SIAT2	80	160	320	320	320	80	80	80	320	640	40

< relates to the lowest dilution of antiserum used  
ND = Not Done

Vaccine  
NH 2021-22

Vaccine  
SH 2022  
NH 2022-23  
SH 2023  
NH 2023-24

< 4-fold   4-fold   8-fold   > 8-fold   < not recognised by the antiserum   ≥ 160 (no homologous titre)



Table H3-12. Antigenic analyses of influenza A(H3N2) viruses (Guinea Pig RBC with 20nM Oseltamivir) 2023-06-09

Viruses	Passage History Ferret number Genetic group	Collection date	Passage history	Haemagglutination inhibition titre													
				Post-infection ferret antisera													
				A/Camb 925256/20 SIAT	A/Camb e6826360/20 Egg	A/Thuringen 10/22 SIAT	A/Stockholm 5/21 SIAT	A/Darwin 9/21 F38/22	A/Norway 24873/21 F10/22	A/Norway 24873/21 F11/22	A/Poland 97/22 F39/22	A/Slovenia 8720/22 F24/22	A/Lille 50053/22 F02/23	A/Catal NSVH-2067/22 SIAT			
F03/21 1a	F10/21 1a	F36/22 2b	F15/22 2a	F39/21 2a	F10/22 2a.3	F11/22 2a.3	F39/22 2a.2	F24/22 2a.1	F02/23 2a.1	F41/22 2a.1b							
<b>REFERENCE VIRUSES</b>																	
A/Cambodia/925256/2020	1a	2020-09-25	SIAT5	640	320	80	160	320	80	160	160	40	160	40			
A/Cambodia/e6826360/2020	1a	2020-07-16	ES/E2	160	1280	80	160	320	80	80	80	320	320	<40			
A/Thuringen/10/2022	2b	2022-04-01	P1/SIAT2	80	320	320	320	320	160	320	160	320	320	160			
A/Stockholm/5/2021	2a	2021-04-16	SIAT0/SIAT4	160	160	160	640	640	80	320	320	640	320	320			
A/Darwin/9/2021	2a	2021-04-17	ES/E2	80	640	160	640	1280	160	320	320	640	640	160			
A/Norway/24873/2021	2a.3	2021-10-24	SIAT4	80	160	160	320	640	320	640	160	320	320	320			
A/Norway/24873/2021	2a.3	2021-10-24	E3/E1	80	320	320	320	640	320	640	320	640	640	320			
A/Poland/97/2022	2a.2	2022-09-09	SIAT3	80	160	80	640	640	160	320	640	640	640	320			
A/Slovenia/8720/2022	2a.1	2022-02-10	SIAT1/MDCK1/SIAT2	160	160	160	640	640	160	640	640	1280	1280	640			
A/Lille/50053/2022	2a.1	2022-09-06	MDCK1/SIAT5	80	160	80	320	320	80	160	320	640	2560	640			
A/Catalonia/NSVH161512067/2022	2a.1b	2022-09-14	SIAT1/SIAT3	40	80	80	320	640	80	160	320	1280	640	640			
<b>TEST VIRUSES</b>																	
A/SaudiArabia/1404/2022	2a	2022-10-05	SIAT1	80	80	80	160	320	640	80	160	320	320	160			
A/Catalonia/3506472NS/2022	2a.1b	2022-09-28	SIAT1	40	80	80	160	320	320	80	160	320	640	640			
A/Greece/370/2022	2a.1b	2022-11-07	SIAT1	40	80	80	160	320	320	80	160	320	640	640			
A/Catalonia/228279NS/2022	2a.1b	2022-10-01	SIAT1	80	160	160	320	640	80	160	320	640	1280	640			
A/Netherlands/12136/2022	2a.1b	2022-12-29	MDCK-MIX2/SIAT1	40	80	80	160	320	320	80	160	320	640	640			
A/Estonia/172628/2023	2a.1b	2023-01-02	SIAT2	40	40	80	160	320	80	160	320	640	640	320			
A/Greece/LL_239/2023	2a.1b	2023-01-02	SIAT1	40	80	80	160	320	80	80	320	320	640	320			
A/Greece/LL_231/2023	2a.1b	2023-01-03	SIAT1	40	80	80	160	320	80	160	320	640	640	320			
A/Greece/15/2023	2a.1b	2023-01-09	SIAT1	40	40	80	160	320	80	80	320	640	640	320			
A/Armenia/167/2023	2a.1b	2023-01-11	SIAT1	40	80	80	320	320	80	160	320	640	640	640			
A/Netherlands/10142/2023	2a.1b	2023-01-12	MDCK-MIX2/SIAT1	80	160	320	640	1280	160	320	1280	1280	1280	640			
A/Netherlands/10226/2023	2a.1b	2023-01-29	MDCK-MIX2/SIAT1	40	80	160	320	640	80	320	640	640	640	640			
A/Netherlands/10228/2023	2a.1b	2023-01-30	MDCK-MIX2/SIAT1	80	160	320	640	1280	160	640	1280	1280	1280	640			
A/Ireland/9047/2023	2a.1b	2023-02-04	SIAT1	40	80	80	160	320	80	80	160	640	640	160			
A/Ireland/9030/2023	2a.1b	2023-02-08	SIAT1	40	80	160	320	640	80	160	320	320	320	160			
A/Netherlands/10277/2023	2a.1b	2023-02-09	MDCK-MIX2/SIAT1	80	320	160	320	640	80	160	320	1280	1280	640			
A/Ireland/21983/2023	2a.1b	2023-04-02	SIAT1	40	80	80	160	320	80	80	160	320	320	160			
A/Greece/267/2022	2a.3a.1	2022-10-11	SIAT1	40	80	160	160	320	160	320	80	160	320	160			
A/Bhida/42154/2022	2a.3a.1	2022-11-07	SIAT2	80	160	160	160	320	320	640	160	320	320	160			
A/SaudiArabia/2439/2022	2a.3a.1	2022-11-14	SIAT1	40	80	160	80	160	160	320	80	80	160	80			
A/Bourmes/4409/2022	2a.3a.1	2022-12-07	ES/E1	<40	40	80	80	160	160	320	80	160	80	80			
A/Netherlands/11905/2022	2a.3a.1	2022-12-13	MDCK-MIX2/SIAT1	40	40	160	160	320	320	640	320	320	160	160			
A/Catalonia/3512877NS/2022	2a.3a.1	2022-12-19	SIAT1	40	80	160	160	320	320	320	160	160	160	80			
A/Bahrain/44511/2022	2a.3a.1	2022-12-20	SIAT1	80	80	160	160	320	320	640	160	160	320	160			
A/Netherlands/10160/2023	2a.3a.1	2023-01-22	MDCK-MIX2/SIAT1	80	160	320	320	640	640	640	320	320	320	320			
A/Netherlands/10132/2023	2a.3b	2023-01-16	MDCK-MIX2/SIAT1	40	80	160	320	640	80	160	320	640	1280	640			
A/SaudiArabia/556/2022	2b	2022-06-25	SIAT1	80	80	320	160	160	40	80	80	160	160	40			
A/Catalonia/223272NS/2022	2b	2022-10-07	SIAT1	80	160	320	320	320	80	160	160	160	320	40			
A/Catalonia/3506448NS/2022	2b	2022-10-10	SIAT1	40	80	320	160	160	40	80	80	160	160	40			
A/Greece/386/2022	2b	2022-11-07	SIAT1	40	80	160	160	160	80	80	80	160	320	40			
A/Greece/416/2022	2b	2022-11-16	SIAT1	80	160	160	320	160	40	80	80	160	320	40			
A/Greece/415/2022	2b	2022-11-16	SIAT1	80	160	160	320	160	80	80	80	160	320	40			
A/Catalonia/3514090NS/2022	2b	2022-12-30	SIAT1	160	160	320	320	320	80	160	160	320	320	80			
A/Greece/LL_113/2023	2b	2023-01-02	SIAT1	80	160	320	320	320	80	160	80	320	320	80			
A/Greece/LL_186/2023	2b	2023-01-03	SIAT1	80	160	320	320	160	80	80	80	160	640	40			
A/Greece/LL_249/2023	2b	2023-01-04	SIAT1	80	320	320	320	160	80	80	80	640	160	40			
A/Greece/LL_433/2023	2b	2023-01-10	SIAT1	80	80	320	320	160	80	160	80	160	160	80			
A/Netherlands/10160/2023	2b	2023-01-23	MDCK-MIX2/SIAT1	80	320	320	320	320	80	160	160	320	640	40			
A/Ireland/9169/2023	2b	2023-02-01	SIAT1	40	80	320	160	160	80	80	80	160	160	40			
A/Netherlands/10192/2023	2b	2023-02-01	MDCK-MIX2/SIAT1	80	160	320	320	320	80	160	160	320	320	80			
A/Ireland/9468/2023	2b	2023-02-07	SIAT2	80	160	320	320	320	80	160	160	320	320	80			
A/Netherlands/10280/2023	2b	2023-02-14	MDCK-MIX2/SIAT1	160	320	640	640	320	160	160	160	320	320	80			
A/Ireland/8661/2023	no seq	2023-02-02	SIAT2	80	160	320	320	160	80	160	80	320	160	40			
A/Ireland/9045/2023	no seq	2023-02-04	SIAT1	40	80	160	320	320	80	160	320	1280	1280	640			

< relates to the lowest dilution of antiserum used  
ND = Not Done

Vaccine  
NH 2021-22

Vaccine  
SH 2022  
NH 2022-23  
SH 2023  
NH 2023-24

□ < 4-fold    □ 4-fold    □ 8-fold    □ > 8-fold    □ not recognised by the antiserum    □ ≥ 160 (no homologous titre)

# HI tables: Influenza B

Table BV-9. Antigenic analyses of influenza B viruses (Victoria lineage) 2023-05-24

Viruses	Other information	Passage history	Collection date	Passage history	Haemagglutination inhibition titre									
					Post-infection ferret antiserum									
					B/Bris 69/08 Egg	B/Colorado 06/17 Egg	B/WashTon 02/19 Egg	B/Neth 11267/22 MDCK	B/Neth 10894/22 Egg	B/Austria 135941/21 MDCK	B/Austria 135941/21 Egg G141	B/Austria 135941/21 Egg G141R	B/Stock 3/22 MDCK	
					Sh 539, 540, 543, 544, 570, 571, 574 <sup>1</sup>	F44/18	F20/20	F29/22	F37/22	NIB F01/21	F15/21	F44/21	F28/22	
	Genetic group				VIA.1	VIA.1	VIA.3	VIA.3	VIA.3	VIA.3a.2	VIA.3a.2	VIA.3a.2	VIA.3a.2	
<b>REFERENCE VIRUSES</b>														
B/Brisbane/60/2008	VIA.1		2008-08-04	E4/E4	1200	160	40	<10	40	<40	<40	<40	<40	<40
B/Colorado/06/2017	VIA.1		2017-02-05	E5/E2	1200	640	80	10	80	<40	<40	<40	<40	<40
B/Washington/02/2019	VIA.3		2019-01-19	E3/E3	640	160	160	20	80	<40	<40	<40	<40	<40
B/Netherlands/11267/2022	VIA.3	MDCK-MIX/MDCK2	2022-04-14		<40	<10	<10	80	20	<40	<40	<40	<40	<40
B/Netherlands/10894/2022	VIA.3	E4/E1	2022-04-02		640	40	40	40	80	<40	<40	<40	<40	<40
B/Austria/135941/2021 G141	VIA.3a.2	SIAT1/MDCK4	2021-01-09		320	<10	<10	10	<10	640	640	160	320	320
B/Austria/135941/2021 Isolate 2 G141	VIA.3a.2	E3/E4	2021-01-09		320	<10	<10	40	10	1280	640	320	320	320
B/Austria/135941/2021 Isolate 2 G141R	VIA.3a.2	E3/E5	2021-01-09		160	<10	<10	20	<10	640	640	2660	320	320
B/Stockholm/3/2022	VIA.3a.2	SIAT1/MDCK3	2022-03-22		320	<10	<10	20	<10	640	640	320	640	640
<b>TEST VIRUSES</b>														
B/Slovenia/186/2023	VIA.3a.2	MDCK0/MDCK1	2023-01-16		320	<10	<10	<10	<10	640	640	160	640	640
B/Slovenia/237/2023	VIA.3a.2	MDCK0/MDCK1	2023-01-19		320	<10	<10	<10	<10	640	640	160	640	640
B/Newport/4988/2023	VIA.3a.2	MDCK2	2023-01-20		640	<10	<10	10	<10	640	640	320	640	640
B/Slovenia/265/2023	VIA.3a.2	MDCK0/MDCK1	2023-01-23		320	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/293/2023	VIA.3a.2	MDCK0/MDCK1	2023-01-24		640	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/304/2023	VIA.3a.2	MDCK0/MDCK1	2023-01-25		320	<10	<10	<10	<10	640	640	160	640	640
B/Slovenia/359/2023	VIA.3a.2	MDCK0/MDCK1	2023-01-31		320	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/404/2023	VIA.3a.2	MDCK0/MDCK1	2023-02-05		320	<10	<10	<10	<10	640	320	160	640	640
B/Slovenia/414/2023	VIA.3a.2	MDCK0/MDCK1	2023-02-06		320	<10	<10	<10	<10	1280	640	320	640	640
B/Slovenia/500/2023	VIA.3a.2	SIAT0/MDCK1	2023-02-15		640	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/605/2023	VIA.3a.2	SIAT0/MDCK1	2023-02-16		320	<10	<10	<10	<10	640	320	160	320	320
B/Slovenia/547/2023	VIA.3a.2	MDCK0/MDCK1	2023-02-20		320	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/590/2023	VIA.3a.2	MDCK0/MDCK1	2023-02-22		640	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/639/2023	VIA.3a.2	MDCK0/MDCK1	2023-02-27		320	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/621/2023	VIA.3a.2	MDCK0/MDCK1	2023-02-27		320	<10	<10	<10	<10	320	640	160	640	640
B/Slovenia/665/2023	VIA.3a.2	MDCK0/MDCK1	2023-02-28		320	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/698/2023	VIA.3a.2	SIAT0/MDCK1	2023-03-05		320	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/724/2023	VIA.3a.2	MDCK0/MDCK1	2023-03-06		640	<10	<10	<10	<10	640	1280	320	640	640
B/Slovenia/732/2023	VIA.3a.2	MDCK0/MDCK1	2023-03-06		320	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/728/2023	VIA.3a.2	MDCK0/MDCK1	2023-03-06		320	<10	<10	<10	<10	320	640	160	320	640
B/Slovenia/744/2023	VIA.3a.2	MDCK0/MDCK1	2023-03-07		320	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/778/2023	VIA.3a.2	MDCK0/MDCK1	2023-03-08		640	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/758/2023	VIA.3a.2	MDCK0/MDCK1	2023-03-08		320	<10	<10	<10	<10	1280	640	320	640	640
B/Slovenia/743/2023	VIA.3a.2	MDCK0/MDCK1	2023-03-08		320	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/853/2023	VIA.3a.2	MDCK0/MDCK1	2023-03-14		640	<10	<10	20	<10	640	640	320	640	640
B/Slovenia/824/2023	VIA.3a.2	MDCK0/MDCK1	2023-03-14		640	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/824/2023	VIA.3a.2	MDCK0/MDCK1	2023-03-22		640	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/838/2023	VIA.3a.2	MDCK0/MDCK1	2023-03-23		640	<10	<10	<10	<10	640	640	160	640	640
B/Slovenia/879/2023	VIA.3a.2	MDCK0/MDCK1	2023-03-28		320	<10	<10	10	<10	640	640	160	640	640
B/Slovenia/1035/2023	VIA.3a.2	MDCK0/MDCK1	2023-04-06		320	<10	<10	<10	<10	640	640	320	640	640
B/Slovenia/1052/2023	VIA.3a.2	MDCK0/MDCK1	2023-04-07		640	<10	<10	<10	<10	640	640	320	640	640
B/Estonia/17417/2023	VIA.3a.2	MDCK1	2023-04-11		320	<10	<10	<10	<10	1280	640	320	320	320
B/Estonia/17417/2023	VIA.3a.2	MDCK1	2023-04-12		320	<10	<10	<10	<10	640	640	320	640	640
B/Estonia/KL 549/2023	VIA.3a.2	MDCK1	2023-04-13		320	<10	<10	<10	<10	640	640	160	640	640
B/Estonia/KL 549/2023	VIA.3a.2	MDCK1	2023-04-13		320	<10	<10	<10	<10	640	640	320	640	640
B/Estonia/17417/2023	VIA.3a.2	MDCK1	2023-04-14		320	<10	<10	<10	<10	640	640	320	640	640

< relates to the lowest dilution of antiserum used

<sup>1</sup> hyperimmune sheep serum; ND = Not Done

Vaccine NH 2021-22

Vaccine SH 2022

NH 2022-23

SH 2023

NH 2023-24

< 4-fold   4-fold   8-fold   > 8-fold   < not recognised by the antiserum   ≥ 160 (no homologous titre)

Table BV-10. Antigenic analyses of influenza B viruses (Victoria lineage) 2023-06-01

Viruses	Other information	Passage history	Collection date	Passage history	Haemagglutination inhibition titre															
					Post-infection ferret antiserum															
					B/Bris 60/08 Egg Sh 539, 540, 543, 544, 570, 571, 574 <sup>1</sup> V1A	B/Colorado 06/17 Egg F44/18 V1A.1	B/Wash'ton 02/19 Egg F20/20 V1A.3	B/Neth 11267/22 MDCK F29/22 V1A.3	B/Neth 10894/22 Egg F37/22 V1A.3	B/Austria 1359417/21 MDCK NIB F01/21 V1A.3a.2	B/Austria 1359417/21 Egg G141 F15/21 V1A.3a.2	B/Austria 1359417/21 Egg G141R F44/21 V1A.3a.2	B/Stock 3/22 MDCK F28/22 V1A.3a.2							
<b>REFERENCE VIRUSES</b>																				
B/Brisbane/60/2008		V1A	2008-08-04	E4/E4	1280	80	40	<10	80	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
B/Colorado/06/2017		V1A.1	2017-02-05	E5/E2	640	320	80	<10	160	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
B/Washington/02/2019		V1A.3	2019-01-19	E3/E3	320	80	160	20	160	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
B/Netherlands/11267/2022		V1A.3	2022-04-14	MDCK-MIX/MDCK2	<40	<10	<10	80	40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
B/Netherlands/10894/2022		V1A.3	2022-04-02	E4/E1	320	20	40	40	160	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
B/Austria/1359417/2021 G141		V1A.3a.2	2021-01-09	SIAT1/MDCK4	160	<10	<10	10	<10	640	640	160	320	640	160	320	640	320	640	320
B/Austria/1359417/2021 Isolate 2 G141		V1A.3a.2	2021-01-09	E3/E4	320	<10	10	20	10	1280	640	320	640	320	640	320	640	320	640	320
B/Austria/1359417/2021 Isolate 2 G141R		V1A.3a.2	2021-01-09	E3/E5	160	<10	<10	20	<10	1280	640	2560	320	640	320	640	320	640	320	640
B/Stockholm/3/2022		V1A.3a.2	2022-03-22	SIAT1/MDCK3	320	<10	<10	10	<10	640	640	320	640	320	640	320	640	320	640	320
<b>TEST VIRUSES</b>																				
B/Astana/18844/2022 (11902)		V1A.3		MDCK1	1280	20	80	40	80	40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
B/Bosnia and Herzegovina/48/2022		V1A.3a.2	2022-11-22	MDCK1	640	20	<10	20	<10	640	640	320	640	320	640	320	640	320	640	320
B/Estonia/172050/2022		V1A.3a.2	2022-12-01	MDCK1	320	<10	<10	10	<10	1280	640	320	640	320	640	320	640	320	640	320
B/Estonia/172315/2022		V1A.3a.2	2022-12-05	MDCK1	320	10	10	10	<10	640	640	160	640	320	640	320	640	320	640	320
B/Bosnia and Herzegovina/61/2022		V1A.3a.2	2022-12-06	MDCK1	640	20	10	20	<10	640	640	320	640	320	640	320	640	320	640	320
B/Serbia/499177/2022		V1A.3a.2	2022-12-15	MDCK1	640	<10	10	20	<10	1280	640	320	640	320	640	320	640	320	640	320
B/Serbia/500612/2023		V1A.3a.2	2023-01-04	MDCK1	640	<10	10	20	<10	640	640	320	640	320	640	320	640	320	640	320
B/Serbia/354/2023		V1A.3a.2	2023-01-15	MDCK1	320	<10	10	20	<10	1280	640	320	640	320	640	320	640	320	640	320
B/Macedonia/335/2023		V1A.3a.2	2023-01-17	MDCK1	320	10	10	20	<10	640	640	320	640	320	640	320	640	320	640	320
B/Estonia/173044/2023		V1A.3a.2	2023-01-20	MDCK1	320	10	<10	20	<10	1280	640	320	640	320	640	320	640	320	640	320
B/Bulgaria/1485/2023		V1A.3a.2	2023-02-14	MDCK2/MDCK1	640	20	10	20	<10	640	640	320	640	320	640	320	640	320	640	320
B/Bulgaria/1643/2023		V1A.3a.2	2023-02-22	MDCK2/MDCK1	640	20	10	10	<10	640	640	160	640	320	640	320	640	320	640	320
B/Bulgaria/1646/2023		V1A.3a.2	2023-02-23	MDCK2/MDCK1	320	<10	<10	10	<10	1280	640	320	640	320	640	320	640	320	640	320
B/Bulgaria/1671/2023		V1A.3a.2	2023-03-07	MDCK2/MDCK1	640	20	10	10	<10	640	640	320	640	320	640	320	640	320	640	320
B/Bulgaria/1734/2023		V1A.3a.2	2023-03-14	MDCK2/MDCK1	320	10	<10	10	<10	640	640	160	640	320	640	320	640	320	640	320
B/Bulgaria/1757/2023		V1A.3a.2	2023-03-15	MDCK2/MDCK1	640	20	10	20	<10	640	640	320	640	320	640	320	640	320	640	320
B/Bulgaria/1756/2023		V1A.3a.2	2023-03-15	MDCK2/MDCK1	320	<10	<10	20	<10	1280	640	320	640	320	640	320	640	320	640	320
B/Bulgaria/1860/2023		V1A.3a.2	2023-03-21	MDCK2/MDCK1	320	10	<10	20	<10	1280	640	320	640	320	640	320	640	320	640	320
B/Bulgaria/1830/2023		V1A.3a.2	2023-03-21	MDCK2/MDCK1	320	10	10	20	<10	640	640	320	640	320	640	320	640	320	640	320
B/Bulgaria/1826/2023		V1A.3a.2	2023-03-21	MDCK2/MDCK1	320	10	10	20	<10	640	640	320	640	320	640	320	640	320	640	320
B/Bulgaria/1823/2023		V1A.3a.2	2023-03-21	MDCK2/MDCK1	320	10	10	20	<10	640	640	320	640	320	640	320	640	320	640	320
B/Bulgaria/1808/2023		V1A.3a.2	2023-03-21	MDCK2/MDCK1	320	10	10	20	<10	640	640	320	640	320	640	320	640	320	640	320
B/Bulgaria/1903/2023	D197N (+CHO)	V1A.3a.2	2023-03-27	MDCK2/MDCK1	<40	<10	<10	20	<10	40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
B/Bulgaria/1896/2023	D197N (+CHO)	V1A.3a.2	2023-03-27	MDCK2/MDCK1	<40	<10	<10	20	<10	40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
B/Bulgaria/1915/2023		V1A.3a.2	2023-03-29	MDCK2/MDCK1	640	20	<10	20	<10	640	640	320	640	320	640	320	640	320	640	320
B/Bulgaria/1929/2023		V1A.3a.2	2023-04-04	MDCK2/MDCK1	320	<10	<10	10	<10	1280	640	320	640	320	640	320	640	320	640	320
B/Slovenia/1024/2023		V1A.3a.2	2023-04-05	MDCK10/MDCK3	320	10	<10	20	<10	640	640	320	640	320	640	320	640	320	640	320
B/EastKazakhstan/1015/2022 (11954)		V1A.3a.2		MDCK1	640	<10	10	20	<10	1280	1280	320	640	320	640	320	640	320	640	320

< relates to the lowest dilution of antiserum used

<sup>1</sup> hyperimmune sheep serum; ND = Not Done

Vaccine NH 2021-22

Vaccine SH 2022 NH 2022-23 SH 2023 NH 2023-24

< 4-fold   4-fold   8-fold   > 8-fold   < not recognised by the antiserum   ≥ 160 (no homologous titre)



Table BV-15. Antigenic analyses of influenza B viruses (Victoria lineage) 2023-08-01

Viruses	Other information	Passage history	Collection date	Passage history	Haemagglutination inhibition titre							
					Post-infection ferret antiserum							
					B/Bris 60/08 Egg Sh 539, 540, 543, 544, 570, 571, 574 <sup>1</sup>	B/Wash'ton 02/19 Egg	B/Austria 1359417/21 MDCK	B/Austria 1359417/21 Egg G141	B/Austria 1359417/21 Egg G141R	B/Stock 3/22 MDCK		
					V1A	V1A.3	V1A.3a.2	V1A.3a.2	V1A.3a.2	V1A.3a.2		
<b>REFERENCE VIRUSES</b>												
B/Brisbane/60/2008	V1A		2008-08-04	E4/E4	2560	80	<40	<40	<40	<40		
B/Washington/02/2019	V1A.3		2019-01-19	E3/E3	640	160	<40	<40	<40			
B/Austria/1359417/2021 G141	V1A.3a.2		2021-01-09	SIAT1/MDCK4	320	10	1280	640	320			
B/Austria/1359417/2021 Isolate 2 G141	V1A.3a.2		2021-01-09	E3/E4	160	10	2560	640	640			
B/Austria/1359417/2021 Isolate 2 G141R	V1A.3a.2		2021-01-09	E3/E5	320	10	1280	640	2560			
B/Stockholm/3/2022	V1A.3a.2		2022-03-22	SIAT1/MDCK3	640	10	1280	640	320			
<b>TEST VIRUSES</b>												
B/Parma/8/2023	V1A.3a.2		2023-02-01	MDCK1/MDCK1	320	<10	640	320	320			
B/FVG-Gorizia/34/2023	V1A.3a.2		2023-02-01	MDCK1/MDCK1	640	10	1280	640	320			
B/FVG-Gorizia/33/2023	V1A.3a.2		2023-02-01	MDCK1/MDCK1	640	10	1280	640	320			
B/Belgium/S1509/2023	V1A.3a.2		2023-02-01	MDCK1/MDCK1	640	10	640	320	320			
B/Belgium/G0178/2023	V1A.3a.2		2023-02-02	MDCK1/MDCK1	640	10	640	320	320			
B/Belgium/G0192/2023	V1A.3a.2		2023-02-03	MDCK1/MDCK1	320	10	640	320	320			
B/Belgium/G0182/2023	V1A.3a.2		2023-02-06	MDCK1/MDCK1	640	10	1280	640	320			
B/Belgium/S1322/2023	V1A.3a.2		2023-02-07	MDCK1/MDCK1	640	10	640	640	320			
B/Belgium/G0187/2023	V1A.3a.2		2023-02-07	MDCK1/MDCK1	640	10	640	640	320			
B/Belgium/S1167/2023	V1A.3a.2		2023-02-09	MDCK1/MDCK1	320	<10	640	640	320			
B/Belgium/S1674/2023	V1A.3a.2		2023-02-12	MDCK1/MDCK1	320	10	1280	640	640			
B/Belgium/S1273/2023	V1A.3a.2		2023-02-13	MDCK1/MDCK1	320	10	640	320	320			
B/Belgium/S1782/2023	V1A.3a.2		2023-02-14	MDCK1/MDCK1	640	10	2560	640	640			
B/Ireland/11305/2023	V1A.3a.2		2023-02-15	MDCK1	640	10	1280	1280	320			
B/Belgium/S1933/2023	V1A.3a.2		2023-02-21	MDCK1/MDCK1	640	10	1280	640	320			
B/Belgium/G0231/2023	V1A.3a.2		2023-02-21	MDCK1/MDCK1	640	10	640	640	320			
B/Belgium/S1960/2023	V1A.3a.2		2023-02-22	MDCK1/MDCK1	640	10	1280	640	640			
B/Belgium/S1397/2023	V1A.3a.2		2023-02-23	MDCK1/MDCK1	640	10	2560	640	640			
B/Belgium/S1957/2023	V1A.3a.2		2023-02-26	MDCK1/MDCK1	640	10	640	640	320			
B/Belgium/S1420/2023	V1A.3a.2		2023-02-27	MDCK1/MDCK1	640	10	1280	640	320			
B/Belgium/G0282/2023	V1A.3a.2		2023-03-16	MDCK1/MDCK1	640	10	1280	640	320			
B/Poland/157/2023	V1A.3a.2		2023-03-29	MDCK1	640	10	2560	1280	640			
B/Estonia/KL484/2023	V1A.3a.2		2023-04-04	MDCK2	1280	20	1280	1280	640			

< relates to the lowest dilution of antiserum used  
<sup>1</sup> hyperimmune sheep serum; ND = Not Done

Vaccine  
NH 2021-22

Vaccine  
SH 2022  
NH 2022-23  
SH 2023  
NH 2023-24

< 4-fold  
  4-fold  
  8-fold  
  > 8-fold  
  < not recognised by the antiserum  
  ≥ 160 (no homologous titre)

Table BV-17. Antigenic analyses of influenza B viruses (Victoria lineage) 2023-08-15

Viruses	Other information	Passage history	Collection date	Passage history	Haemagglutination inhibition titre						
					Post-infection ferret antiserum						
					B/Bris 60/08 Egg	B/Wash'ton 02/19 Egg	B/Austria 1359417/21 MDCK	B/Austria 1359417/21 Egg G141	B/Austria 1359417/21 Egg G141R	B/Stock 3/22 MDCK	
					Sh 539, 540, 543, 544, 570, 571, 574 <sup>1</sup>	F20/20	NIB F01/21	F15/21	F44/21	F28/22	
					Genetic group	V1A	V1A.3	V1A.3a.2	V1A.3a.2	V1A.3a.2	V1A.3a.2
<b>REFERENCE VIRUSES</b>											
B/Brisbane/60/2008		V1A	2008-08-04	E4/E4	2560	160	<40	<40	<40	<40	
B/Washington/02/2019		V1A.3	2019-01-19	E3/E3	640	320	<40	<40	<40	<40	
B/Austria/1359417/2021 G141		V1A.3a.2	2021-01-09	SIAT1/MDCK4	320	20	1280	640	320	320	
B/Austria/1359417/2021 Isolate 2 G141		V1A.3a.2	2021-01-09	E3/E4	640	20	1280	640	640	640	
B/Austria/1359417/2021 Isolate 2 G141R		V1A.3a.2	2021-01-09	E3/E5	320	20	1280	640	2560	640	
B/Stockholm/3/2022		V1A.3a.2	2022-03-22	SIAT1/MDCK3	640	10	640	640	320	640	
<b>TEST VIRUSES</b>											
B/Estonia/173317/2023		V1A.3a.2	2023-02-03	MDCK1	640	20	640	640	320	640	
B/Estonia/173429/2023		V1A.3a.2	2023-02-15	MDCK1	640	20	1280	640	320	320	
B/Estonia/173580/2023		V1A.3a.2	2023-02-22	MDCK1	640	20	1280	640	320	640	
B/Estonia/173587/2023		V1A.3a.2	2023-02-27	MDCK1	640	20	1280	640	320	320	
B/Estonia/173777/2023		V1A.3a.2	2023-03-07	MDCK1	1280	40	1280	640	320	640	
B/Estonia/173928/2023		V1A.3a.2	2023-03-23	MDCK1	1280	40	1280	1280	640	640	
B/Estonia/173900/2023		V1A.3a.2	2023-03-25	MDCK1	640	20	1280	640	320	640	
B/Estonia/173585/2023		V1A.3a.2	2023-03-27	MDCK1	1280	40	1280	640	640	640	
B/Romania/550752/2023		V1A.3a.2	2023-04-21	SIAT1/MDCK1	320	10	640	320	320	320	
B/Burgos/4840/2023		V1A.3a.2	2023-04-25	MDCK1	640	20	640	640	320	640	
B/Avila/4883/2023		V1A.3a.2	2023-04-29	MDCK1	1280	20	1280	640	320	640	
B/Palencia/4842/2023		V1A.3a.2	2023-05-03	MDCK1	1280	40	1280	640	640	640	
B/Salamanca/4852/2023		V1A.3a.2	2023-05-05	MDCK1	1280	40	1280	640	640	640	
B/Salamanca/4851/2023		V1A.3a.2	2023-05-05	MDCK1	640	20	1280	640	320	640	
B/Burgos/4893/2023		V1A.3a.2	2023-05-08	MDCK1	1280	20	1280	640	320	640	
B/Segovia/4864/2023		V1A.3a.2	2023-05-10	MDCK1	640	20	1280	640	320	640	
B/Leon/4901/2023		V1A.3a.2	2023-05-16	MDCK1	640	20	1280	640	640	640	
B/HongKong/15/2023		V1A.3a.2	2023-06-17	MDCK1/MDCK1	640	20	640	640	320	640	

< relates to the lowest dilution of antiserum used

<sup>1</sup> hyperimmune sheep serum; ND = Not Done

Vaccine  
NH 2021-22

Vaccine  
SH 2022  
NH 2022-23  
SH 2023  
NH 2023-24

< 4-fold  
  4-fold  
  8-fold  
  > 8-fold  
  < not recognised by the antiserum  
  ≥ 160 (no homologous titre)

Table BV-21. Antigenic analyses of influenza B viruses (Victoria lineage) 2023-09-27

Viruses	Other information	Passage	Ferret number	Genetic group	Collection Date	Genetic group	Haemagglutination inhibition titre					
							Post-infection ferret antiserum					
							B/Bris 6/0/08 Egg	B/Wash <sup>1</sup> on 02/19 Egg	B/Austria 13594/17/21 MDCK	B/Austria 13594/17/21 Egg G141	B/Austria 13594/17/21 Egg G141R	B/Stock 3/22 MDCK
Sh 539, 540, 543, 544, 570, 571, 5741	F20/20	NIB F01/21	F40/21	F44/21	F28/22							
				Genetic group	Collection Date	Genetic group	V1A	V1A.3	V1A.3a.2	V1A.3a.2	V1A.3a.2	V1A.3a.2
<b>REFERENCE VIRUSES</b>												
B/Brisbane/60/2008				V1A	2008-08-04	E4/E4	1280	40	<40	<40	<40	<40
B/Washington/02/2019				V1A.3	2019-01-19	E3/E3	640	160	40	<40	<40	<40
B/Austria/13594/17/2021	A127T, P144L, K302R (G141)			V1A.3a.2	2021-01-09	SIAT1/MDCK4	640	<10	1280	640	320	320
B/Austria/13594/17/2021 Isolate 2	A127T, P144L, K302R (G141)			V1A.3a.2	2021-01-09	E3/E4	320	<10	1280	640	320	320
B/Austria/13594/17/2021 Isolate 2	A127T, P144L, K302R (G141R)			V1A.3a.2	2021-01-09	E3/E5	160	<10	1280	320	2560	320
B/Stockholm/3/2022	D129G, E183K, D197E			V1A.3a.2	2022-03-22	SIAT1/MDCK3	320	<10	640	320	320	640
<b>TEST VIRUSES</b>												
235467	B/Bratislava/155/2023			V1A.3a.2	2023-02-21	MDCK2	320	<10	640	320	160	320
233836	B/Estonia/173671/2023			V1A.3a.2	2023-03-04	MDCK1	640	10	1280	640	320	320
234127	B/Poland/123/2023			V1A.3a.2	2023-03-05	MDCK1	320	<10	1280	640	320	320
234126	B/Poland/143/2023			V1A.3a.2	2023-03-06	MDCK1	320	<10	640	640	320	640
233834	B/Estonia/173722/2023			V1A.3a.2	2023-03-07	MDCK1	640	<10	640	320	320	640
234120	B/Poland/135/2023			V1A.3a.2	2023-03-08	MDCK1	320	<10	1280	640	320	320
234121	B/Poland/126/2023			V1A.3a.2	2023-03-08	MDCK1	320	<10	1280	640	320	320
234116	B/Poland/142/2023			V1A.3a.2	2023-03-09	MDCK1	320	<10	1280	640	320	320
234113	B/Poland/137/2023			V1A.3a.2	2023-03-11	MDCK1	320	<10	640	320	160	640
234110	B/Poland/161/2023			V1A.3a.2	2023-03-12	MDCK1	640	<10	1280	640	320	640
234111	B/Poland/140/2023			V1A.3a.2	2023-03-12	MDCK1	320	<10	1280	640	320	640
234106	B/Poland/134/2023			V1A.3a.2	2023-03-14	MDCK1	640	10	640	640	320	640
235581	B/Cat/3520958NS/2023			V1A.3a.2	2023-03-19	P0/MDCK1	320	10	640	320	160	320
234077	B/Poland/189/2023			V1A.3a.2	2023-03-21	MDCK1	640	<10	640	320	320	640
234143	B/Poland/102/2023			V1A.3a.2	2023-03-27	MDCK1	640	<10	640	320	320	640
235578	B/Cat/3521492NS/2023			V1A.3a.2	2023-03-27	P0/MDCK1	640	<10	640	320	160	320
234139	B/Poland/99/2023			V1A.3a.2	2023-03-31	MDCK1	320	<10	640	640	320	640
234137	B/Poland/96/2023			V1A.3a.2	2023-04-05	MDCK1	640	<10	640	320	160	640
235580	B/Cat/3522202NS/2023			V1A.3a.2	2023-04-06	P0/MDCK1	320	<10	320	320	160	320
235579	B/Cat/352255NS/2023			V1A.3a.2	2023-04-11	P0/MDCK1	320	<10	640	320	320	320
235577	B/Cat/352276NS/2023			V1A.3a.2	2023-04-15	P0/MDCK1	320	<10	640	320	160	320
235576	B/Cat/2025676NS/2023			V1A.3a.2	2023-04-19	P0/MDCK1	320	<10	1280	640	320	320
234234	B/Burgos/4894/2023			V1A.3a.2	2023-05-08	MDCK1	320	<10	640	320	320	640
235571	B/Denmark/1846/2023			V1A.3a.2	2023-05-08	SIAT2/MDCK1	320	<10	640	320	160	320
235575	B/Cat/3524181NS/2023			V1A.3a.2	2023-05-08	P0/MDCK1	320	<10	640	640	320	640
235574	B/Cat/3525527NS/2023			V1A.3a.2	2023-05-29	P0/MDCK1	640	<10	640	320	320	320
235570	B/Denmark/1854/2023			V1A.3a.2	2023-06-02	SIAT2/MDCK1	320	<10	640	320	160	640

< relates to the lowest dilution of antiserum used  
<sup>1</sup> hyperimmune sheep serum; ND = Not Done

Vaccine  
NH 2021-22

Vaccine  
SH 2022  
NH 2022-23  
SH 2023  
NH 2023-24

< 4-fold  
  4-fold  
  8-fold  
  > 8-fold  
  < not recognised by the antiserum  
  ≥ 160 (no homologous titre)

# Summary of sample characterisation

We follow a sequencing-first approach where we sequence all the clinical samples, with further selection of samples for isolation in cell culture and antigenic characterisation based on representative genetic diversity. Samples with identical sequences may not be selected for further characterisation.

Virus name	Original passage sent	Collection date	Type/Subtype	Date received	Antigenic characterisation			Genetic characterisation				Antiviral susceptibility phenotypic testing			
					HI table date	HI comments	WIC Passage history	Genetic clade	Submitted to GISAIID	EPI Accession	Sequencing comments	Osetamivir	Zanamivir	Baloxavir marboxil	
B/Estonia/173034/2023	cs	2023-01-23	BV	2023-02-06		Virus not recovered	cs	V1A.3a.2	2023-03-16	17225766					
B/Estonia/173044/2023	cs	2023-01-20	BV	2023-02-06	2023-06-01		cs	V1A.3a.2	2023-03-16	17225841			Normal inhibition	Normal inhibition	
B/Estonia/173044/2023	cs	2023-01-20	BV	2023-02-06	2023-06-01		MDCK1	V1A.3a.2	2023-06-21	17820100			Normal inhibition	Normal inhibition	
B/Estonia/172315/2022	cs	2022-12-05	BV	2023-02-06	2023-06-01		cs	V1A.3a.2	2023-03-16	17225840			Normal inhibition	Normal inhibition	
B/Estonia/172315/2022	cs	2022-12-05	BV	2023-02-06	2023-06-01		MDCK1	V1A.3a.2	2023-06-21	17820101			Normal inhibition	Normal inhibition	
B/Estonia/172050/2022	cs	2022-12-01	BV	2023-02-06	2023-06-01		cs	V1A.3a.2	2023-03-16	17225768			Normal inhibition	Normal inhibition	
B/Estonia/172050/2022	cs	2022-12-01	BV	2023-02-06	2023-06-01		MDCK1	V1A.3a.2	2023-06-21	17820102			Normal inhibition	Normal inhibition	
A/Estonia/173037/2023	cs	2023-01-23	H1pdm	2023-02-06	2023-06-01		cs	5a.2a	2023-03-16	17225340					
A/Estonia/173037/2023	cs	2023-01-23	H1pdm	2023-02-06	2023-06-01		MDCK1	5a.2a	2023-06-21	17820129					
A/Estonia/172995/2023	cs	2023-01-21	H1pdm	2023-02-06		Identical sequence – not cultured	cs	5a.2a	2023-03-16	17225329					
A/Estonia/172997/2023	cs	2023-01-18	H1pdm	2023-02-06	2023-06-01		cs	5a.2a	2023-03-16	17225329		no sequence	Normal inhibition	Normal inhibition	
A/Estonia/172997/2023	cs	2023-01-18	H1pdm	2023-02-06	2023-06-01		MDCK2	5a.2a	2023-06-21	17820130			Normal inhibition	Normal inhibition	
A/Estonia/172935/2023	cs	2023-01-15	H1pdm	2023-02-06		Failed sequence – not cultured	cs					no sequence			
A/Estonia/172882/2023	cs	2023-01-15	H1pdm	2023-02-06		Virus not recovered	cs	5a.2a.1	2023-03-16	17225293					
A/Estonia/172881/2023	cs	2023-01-15	H1pdm	2023-02-06	2023-06-01		cs					no sequence	Normal inhibition	Normal inhibition	
A/Estonia/172881/2023	cs	2023-01-15	H1pdm	2023-02-06	2023-06-01		MDCK1	5a.2a	2023-06-21	17820131			Normal inhibition	Normal inhibition	
A/Estonia/172786/2023	cs	2023-01-10	H1pdm	2023-02-06		Identical sequence – not cultured	cs	5a.2a.1	2023-03-16	17225306					
A/Estonia/KL51/2023	cs	2023-01-09	H1pdm	2023-02-06		Identical sequence – not cultured	cs	5a.2a	2023-03-16	17225305					
A/Estonia/172762/2023	cs	2023-01-09	H1pdm	2023-02-06		Identical sequence – not cultured	cs	5a.2a	2023-03-16	17225304					
A/Estonia/172757/2023	cs	2023-01-09	H1pdm	2023-02-06		Identical sequence – not cultured	cs	5a.2a	2023-03-16	17225303					
A/Estonia/172759/2023	cs	2023-01-06	H1pdm	2023-02-06		Identical sequence – not cultured	cs	5a.2a	2023-03-16	17225302					
A/Estonia/KL26/2023	cs	2023-01-04	H1pdm	2023-02-06		Identical sequence – not cultured	cs	5a.2a	2023-03-16	17225301					
A/Estonia/172644/2022	cs	2022-12-27	H1pdm	2023-02-06		Identical sequence – not cultured	cs	5a.2a	2023-03-16	17225292					
A/Estonia/172548/2022	cs	2022-12-27	H1pdm	2023-02-06	2023-06-01		cs					no sequence	Normal inhibition	Normal inhibition	
A/Estonia/172548/2022	cs	2022-12-27	H1pdm	2023-02-06	2023-06-01		MDCK1	5a.2a	2023-06-21	17820132			Normal inhibition	Normal inhibition	
A/Estonia/172492/2022	cs	2022-12-26	H1pdm	2023-02-06		Identical sequence – not cultured	cs	5a.2a.1	2023-03-16	17225299					
A/Estonia/172516/2022	cs	2022-12-21	H1pdm	2023-02-06		Identical sequence – not cultured	cs	5a.2a	2023-03-16	17225307					
A/Estonia/KL728/2022	cs	2022-12-20	H1pdm	2023-02-06	2023-06-01		cs	5a.2a	2023-03-16	17225316			Normal inhibition	Normal inhibition	
A/Estonia/KL728/2022	cs	2022-12-20	H1pdm	2023-02-06	2023-06-01		MDCK1	5a.2a	2023-06-21	17820133			Normal inhibition	Normal inhibition	
A/Estonia/KL727/2022	cs	2022-12-20	H1pdm	2023-02-06		Virus not recovered	cs	5a.2a.1	2023-03-16	17225297					
A/Estonia/KL727/2022	cs	2022-12-20	H1pdm	2023-02-06		Virus not recovered	MDCK1								
A/Estonia/KL714/2022	cs	2022-12-13	H1pdm	2023-02-06		Virus not recovered	cs					no sequence			
A/Estonia/KL7103/2022	cs	2022-12-13	H1pdm	2023-02-06		Virus not recovered	cs	5a.2a	2023-03-16	17225327					
A/Estonia/KL7088/2022	cs	2022-12-13	H1pdm	2023-02-06		Identical sequence – not cultured	cs	5a.2a	2023-03-16	17225295					
A/Estonia/172371/2022	cs	2022-12-13	H1pdm	2023-02-06		Identical sequence – not cultured	cs	5a.2a	2023-02-28	17049195					
A/Estonia/172163/2022	cs	2022-12-09	H1pdm	2023-02-06		Failed sequence – not cultured	cs					no sequence			
A/Estonia/172049/2022	cs	2022-12-01	H1pdm	2023-02-06		Identical sequence – not cultured	cs	5a.2a	2023-02-28	17049191					
A/Estonia/171861/2022	cs	2022-11-25	H1pdm	2023-02-06		Failed sequence – not cultured	cs					no sequence			
A/Estonia/173038/2023	cs	2023-01-23	H3	2023-02-06	2023-05-26		cs	2b	2023-02-28	17049162			Normal inhibition	Normal inhibition	
A/Estonia/173038/2023	cs	2023-01-23	H3	2023-02-06	2023-05-26		SIAT1	2b	2023-06-21	17820162			Normal inhibition	Normal inhibition	
A/Estonia/173028/2023	cs	2023-01-21	H3	2023-02-06	2023-05-26		cs					no sequence	Insufficient Titre	Insufficient Titre	
A/Estonia/173028/2023	cs	2023-01-21	H3	2023-02-06	2023-05-26		SIAT1	2b	2023-06-21	17820163			Insufficient Titre	Insufficient Titre	
A/Estonia/173098/2023	cs	2023-01-19	H3	2023-02-06		Identical sequence – not cultured	cs	2b	2023-02-28	17049161					
A/Estonia/172883/2023	cs	2023-01-13	H3	2023-02-06	2023-05-26		cs	2a.1b	2023-02-28	17049160			Normal inhibition	Normal inhibition	
A/Estonia/172883/2023	cs	2023-01-13	H3	2023-02-06	2023-05-26		SIAT1	2a.1b	2023-06-21	17820164			Normal inhibition	Normal inhibition	
A/Estonia/172886/2023	cs	2023-01-11	H3	2023-02-06	2023-05-26		cs	2a.1b	2023-02-28	17049159			Normal inhibition	Normal inhibition	
A/Estonia/172886/2023	cs	2023-01-11	H3	2023-02-06	2023-05-26		SIAT1	2a.1b	2023-06-21	17820165			Normal inhibition	Normal inhibition	
A/Estonia/172892/2023	cs	2023-01-10	H3	2023-02-06		Identical sequence – not cultured	cs	2b	2023-02-28	17049158					
A/Estonia/KL34/2023	cs	2023-01-05	H3	2023-02-06		Failed sequence – not cultured	cs					no sequence			
A/Estonia/172629/2023	cs	2023-01-02	H3	2023-02-06	2023-06-09		cs					no sequence	Normal inhibition	Normal inhibition	
A/Estonia/172629/2023	cs	2023-01-02	H3	2023-02-06	2023-06-09		SIAT2	2a.1b	2023-06-21	17820166			Normal inhibition	Normal inhibition	
A/Estonia/172610/2023	cs	2023-01-02	H3	2023-02-06		Identical sequence – not cultured	cs	2b	2023-02-28	17049157					
A/Estonia/172691/2023	cs	2023-01-01	H3	2023-02-06		Identical sequence – not cultured	cs	2b	2023-02-28	17049143					
A/Estonia/172631/2023	cs	2023-01-01	H3	2023-02-06	2023-05-26		cs	2a.1b	2023-02-28	17049155			Normal inhibition	Normal inhibition	
A/Estonia/172631/2023	cs	2023-01-01	H3	2023-02-06	2023-05-26		SIAT1	2a.1b	2023-06-21	17820167			Normal inhibition	Normal inhibition	
A/Estonia/172630/2023	cs	2023-01-01	H3	2023-02-06		Identical sequence – not cultured	cs	2b	2023-02-28	17049168					
A/Estonia/KL3 /2022	cs	2022-12-30	H3	2023-02-06		Identical sequence – not cultured	cs	2b	2023-02-28	17049153					
A/Estonia/KL7285/2022	cs	2022-12-28	H3	2023-02-06		Identical sequence – not cultured	cs	2a.1b	2023-02-28	17049152					
A/Estonia/KL727/2022	cs	2022-12-28	H3	2023-02-06	2023-05-26		cs	2a.1b	2023-02-28	17049170			Normal inhibition	Normal inhibition	



(continued)

Virus name	Original passage sent	Collection date	Type/Subtype	Date received	Antigenic characterisation			Genetic characterisation				Antiviral susceptibility phenotypic testing			
					HI table date	HI comments	WIC Passage history	Genetic clade	Submitted to GISAID	EPI Accession	Sequencing comments	Osetamivir	Zanamivir	Baloxavir marboxil	
A/Estonia/KL7277/2022	cs	2022-12-28	H3	2023-02-06	2023-05-26		SIAT1	2a.1b	2023-06-21	17820168			Normal inhibition	Normal inhibition	
A/Estonia/172639/2022	cs	2022-12-27	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-02-28	17049151					
A/Estonia/172547/2022	cs	2022-12-27	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049156					
A/Estonia/172543/2022	cs	2022-12-25	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-02-28	17049150					
A/Estonia/172575/2022	cs	2022-12-24	H3	2023-02-06	2023-05-26		cs	2b	2023-02-28	17049149			Normal inhibition	Normal inhibition	
A/Estonia/172575/2022	cs	2022-12-24	H3	2023-02-06	2023-05-26		SIAT1	2b	2023-06-21	17820169			Normal inhibition	Normal inhibition	
A/Estonia/172487/2022	cs	2022-12-24	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049148					
A/Estonia/KL7231/2022	cs	2022-12-22	H3	2023-02-06		Virus not recovered	cs	2b	2023-02-28	17049147					
A/Estonia/172466/2022	cs	2022-12-21	H3	2023-02-06		Virus not recovered	cs				no sequence				
A/Estonia/172464/2022	cs	2022-12-19	H3	2023-02-06	2023-05-26		cs	2a.1b	2023-02-28	17049146			Normal inhibition	Normal inhibition	
A/Estonia/172464/2022	cs	2022-12-19	H3	2023-02-06	2023-05-26		SIAT1	2a.1b	2023-06-21	17820170			Normal inhibition	Normal inhibition	
A/Estonia/172379/2022	cs	2022-12-19	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049145					
A/Estonia/KL7133/2022	cs	2022-12-14	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049144					
A/Estonia/172437/2022	cs	2022-12-14	H3	2023-02-06	2023-05-26		cs	2a.1b	2023-02-28	17049154			Normal inhibition	Normal inhibition	
A/Estonia/172437/2022	cs	2022-12-14	H3	2023-02-06	2023-05-26		SIAT1	2a.1b	2023-06-21	17820171			Normal inhibition	Normal inhibition	
A/Estonia/172436/2022	cs	2022-12-13	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049171					
A/Estonia/172394/2022	cs	2022-12-13	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049188					
A/Estonia/172051/2022	cs	2022-12-13	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049187					
A/Estonia/KL7045/2022	cs	2022-12-12	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-02-28	17049186					
A/Estonia/172366/2022	cs	2022-12-12	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049185					
A/Estonia/172236/2022	cs	2022-12-11	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049184					
A/Estonia/172195/2022	cs	2022-12-11	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049183					
A/Estonia/172172/2022	cs	2022-12-10	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049182					
A/Estonia/172187/2022	cs	2022-12-09	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049181					
A/Estonia/172181/2022	cs	2022-12-09	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-02-28	17049180					
A/Estonia/172219/2022	cs	2022-12-08	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049169					
A/Estonia/172138/2022	cs	2022-12-07	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049179					
A/Estonia/172137/2022	cs	2022-12-07	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-02-28	17049189					
A/Estonia/172107/2022	cs	2022-12-07	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-02-28	17049178					
A/Estonia/172106/2022	cs	2022-12-07	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049177					
A/Estonia/172111/2022	cs	2022-12-06	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049176					
A/Estonia/172078/2022	cs	2022-12-06	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-02-28	17049175					
A/Estonia/172077/2022	cs	2022-12-06	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-02-28	17049174					
A/Estonia/172074/2022	cs	2022-12-06	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-03-16	17223835					
A/Estonia/172058/2022	cs	2022-12-05	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-03-16	17223849					
A/Estonia/172053/2022	cs	2022-12-05	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-03-16	17223864					
A/Estonia/172016/2022	cs	2022-12-05	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-03-16	17223847					
A/Estonia/172034/2022	cs	2022-12-04	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-03-16	17223846					
A/Estonia/172023/2022	cs	2022-12-04	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-03-16	17223845					
A/Estonia/172009/2022	cs	2022-12-04	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-03-16	17223844					
A/Estonia/172022/2022	cs	2022-12-03	H3	2023-02-06		Virus not recovered	cs				no sequence				
A/Estonia/KL6953/2022	cs	2022-12-02	H3	2023-02-06		Virus not recovered	cs	2a.1	2023-03-16	17223842					
A/Estonia/171948/2022	cs	2022-11-30	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-03-16	17223841					
A/Estonia/171947/2022	cs	2022-11-30	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-03-16	17223840					
A/Estonia/171943/2022	cs	2022-11-29	H3	2023-02-06		Virus not recovered	cs				no sequence				
A/Estonia/171921/2022	cs	2022-11-29	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-03-16	17223839					
A/Estonia/171919/2022	cs	2022-11-29	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-03-16	17223838					
A/Estonia/171918/2022	cs	2022-11-29	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-03-16	17223837					
A/Estonia/171881/2022	cs	2022-11-28	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-03-16	17223836					
A/Estonia/171880/2022	cs	2022-11-28	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-03-16	17223882					
A/Estonia/171884/2022	cs	2022-11-27	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-03-16	17223894					
A/Estonia/171888/2022	cs	2022-11-26	H3	2023-02-06		Failed sequence - not cultured	cs				no sequence				
A/Estonia/171890/2022	cs	2022-11-25	H3	2023-02-06		Failed sequence - not cultured	cs				no sequence				
A/Estonia/171834/2022	cs	2022-11-24	H3	2023-02-06		Identical sequence - not cultured	cs	2a.1b	2023-03-16	17223850					
A/Estonia/171793/2022	cs	2022-11-22	H3	2023-02-06		Identical sequence - not cultured	cs	2b	2023-03-16	17223965					
A/Estonia/171754/2022	cs	2022-11-18	H3	2023-02-06		Failed sequence - not cultured	cs				no sequence				
B/Estonia/174160/2023	cs	2023-04-16	BV	2023-05-15		Virus not recovered	cs	VIA.3a.2	2023-07-20	18007288					
B/Estonia/174162/2023	cs	2023-04-15	BV	2023-05-15		Virus not recovered	cs				no sequence				
B/Estonia/174161/2023	cs	2023-04-15	BV	2023-05-15		Virus not recovered	cs	VIA.3a.2	2023-07-20	18007289					
B/Estonia/174174/2023	cs	2023-04-14	BV	2023-05-15	2023-05-24		cs	VIA.3a.2	2023-07-20	18007290			Normal inhibition	Normal inhibition	
B/Estonia/174174/2023	cs	2023-04-14	BV	2023-05-15	2023-05-24		MDCK1	VIA.3a.2	2023-07-20	18008416			Normal inhibition	Normal inhibition	
B/Estonia/KL549/2023	cs	2023-04-13	BV	2023-05-15	2023-05-24		cs	VIA.3a.2	2023-07-20	18007291			Normal inhibition	Normal inhibition	
B/Estonia/KL549/2023	cs	2023-04-13	BV	2023-05-15	2023-05-24		MDCK1	VIA.3a.2	2023-07-20	18008418			Normal inhibition	Normal inhibition	
B/Estonia/KL548/2023	cs	2023-04-13	BV	2023-05-15	2023-05-24		cs	VIA.3a.2	2023-06-21	17820224			Normal inhibition	Normal inhibition	
B/Estonia/KL548/2023	cs	2023-04-13	BV	2023-05-15	2023-05-24		MDCK1				no sequence		Normal inhibition	Normal inhibition	
B/Estonia/174175/2023	cs	2023-04-12	BV	2023-05-15	2023-05-24		cs	VIA.3a.2	2023-06-21	17820213			Normal inhibition	Normal inhibition	
B/Estonia/174175/2023	cs	2023-04-12	BV	2023-05-15	2023-05-24		MDCK1	VIA.3a.2	2023-07-20	18008417			Normal inhibition	Normal inhibition	



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Virus name	Original passage sent	Collection date	Type/Subtype	Date received	Antigenic characterisation			Genetic characterisation				Antiviral susceptibility phenotypic testing			
					HI table date	HI comments	WIC Passage history	Genetic clade	Submitted to GISAID	EPI Accession	Sequencing comments	Osetamivir	Zanamivir	Baloxavir marboxil	
B/Estonia/173173/2023	cs	2023-01-27	BV	2023-05-15		Failed sequence – not cultured	cs					no sequence			
A/Estonia/174173/2023	cs	2023-04-16	H1pdm	2023-05-15		Virus not recovered	cs					no sequence			
A/Estonia/174171/2023	cs	2023-04-14	H1pdm	2023-05-15	2023-05-23		cs	5a.2a	2023-06-21	17820192			Normal inhibition	Normal inhibition	
A/Estonia/174171/2023	cs	2023-04-14	H1pdm	2023-05-15	2023-05-23		MDCK1	5a.2a	2023-07-20	18008446			Normal inhibition	Normal inhibition	
A/Estonia/174085/2023	cs	2023-04-09	H1pdm	2023-05-15		Virus not recovered	cs					no sequence			
A/Estonia/KL487/2023	cs	2023-04-05	H1pdm	2023-05-15		Virus not recovered	cs					no sequence			
A/Estonia/173780/2023	cs	2023-03-07	H1pdm	2023-05-15	2023-05-23		cs	5a.2a	2023-06-21	17820190			Normal inhibition	Normal inhibition	
A/Estonia/173780/2023	cs	2023-03-07	H1pdm	2023-05-15	2023-05-23		MDCK1	5a.2a	2023-07-20	18008445			Normal inhibition	Normal inhibition	
A/Estonia/173716/2023	cs	2023-03-07	H1pdm	2023-05-15		Virus not recovered	cs					no sequence			
A/Estonia/173652/2023	cs	2023-03-02	H1pdm	2023-05-15	2023-05-23		cs	5a.2a	2023-06-21	17820193			Normal inhibition	Normal inhibition	
A/Estonia/173652/2023	cs	2023-03-02	H1pdm	2023-05-15	2023-05-23		MDCK1	5a.2a	2023-07-20	18008538			Normal inhibition	Normal inhibition	
A/Estonia/KL318/2023	cs	2023-02-27	H1pdm	2023-05-15	2023-06-01		cs					no sequence	Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/KL318/2023	cs	2023-02-27	H1pdm	2023-05-15	2023-06-01		MDCK2	5a.2a	2023-06-21	17820159			Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/173557/2023	cs	2023-02-21	H1pdm	2023-05-15	2023-05-23		cs	5a.2a	2023-06-21	17820194			Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/173557/2023	cs	2023-02-21	H1pdm	2023-05-15	2023-05-23		MDCK1	5a.2a	2023-07-20	18008539			Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/KL262/2023	cs	2023-02-14	H1pdm	2023-05-15	2023-05-23		cs	5a.2a	2023-06-21	17820195			Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/KL262/2023	cs	2023-02-14	H1pdm	2023-05-15	2023-05-23		MDCK1	5a.2a	2023-07-20	18008531			Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/173456/2023	cs	2023-02-14	H1pdm	2023-05-15	2023-05-23		cs	5a.2a	2023-06-21	17820191			Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/173456/2023	cs	2023-02-14	H1pdm	2023-05-15	2023-05-23		MDCK1	5a.2a	2023-07-20	18008535			Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/173432/2023	cs	2023-02-14	H1pdm	2023-05-15	2023-05-23		cs					no sequence	Failed	Failed	Failed
A/Estonia/173432/2023	cs	2023-02-14	H1pdm	2023-05-15	2023-05-23		MDCK1	5a.2a	2023-07-20	18008534			Failed	Failed	Failed
A/Estonia/KL248/2023	cs	2023-02-10	H1pdm	2023-05-15		Virus not recovered	cs	5a.2a	2023-06-21	17820200					
A/Estonia/173339/2023	cs	2023-02-09	H1pdm	2023-05-15		Virus not recovered	cs					no sequence			
A/Estonia/173338/2023	cs	2023-02-09	H1pdm	2023-05-15	2023-08-01		cs	5a.2a	2023-06-21	17820196			Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/173338/2023	cs	2023-02-09	H1pdm	2023-05-15	2023-08-01		MDCK2					no sequence	Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/173321/2023	cs	2023-02-07	H1pdm	2023-05-15	2023-07-25		cs	5a.2a	2023-06-21	17820197			Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/173321/2023	cs	2023-02-07	H1pdm	2023-05-15	2023-07-25		MDCK1	5a.2a	2023-08-31	18167241			Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/173293/2023	cs	2023-02-07	H1pdm	2023-05-15		Virus not recovered	cs					no sequence			
A/Estonia/173320/2023	cs	2023-02-05	H1pdm	2023-05-15	2023-07-25		cs					no sequence	Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/173320/2023	cs	2023-02-05	H1pdm	2023-05-15	2023-07-25		MDCK1	5a.2a	2023-08-31	18167242			Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/173262/2023	cs	2023-02-05	H1pdm	2023-05-15		Virus not recovered	cs					no sequence			
A/Estonia/173318/2023	cs	2023-02-04	H1pdm	2023-05-15	2023-08-08		cs	5a.2a	2023-06-21	17820198			Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/173318/2023	cs	2023-02-04	H1pdm	2023-05-15	2023-08-08		MDCK1	5a.2a	2023-08-31	18167501			Normal inhibition	Normal inhibition	Normal inhibition
A/Estonia/173244/2023	cs	2023-02-02	H1pdm	2023-05-15		Virus not recovered	cs					no sequence			
A/Estonia/KL184/2023	cs	2023-01-31	H1pdm	2023-05-15		Virus not recovered	cs					no sequence			
A/Estonia/173282/2023	cs	2023-01-31	H1pdm	2023-05-15		Virus not recovered	cs	5a.2a	2023-06-21	17820199					
A/Estonia/173168/2023	cs	2023-01-28	H1pdm	2023-05-15		Virus not recovered	cs	5a.2a.1	2023-06-21	17820201					
A/Estonia/173775/2023	cs	2023-03-13	H3	2023-05-15		Virus not recovered	cs					no sequence			
A/Estonia/173741/2023	cs	2023-03-08	H3	2023-05-15	2023-05-26		cs	2a.1b	2023-06-21	17820181			Normal inhibition	Normal inhibition	
A/Estonia/173741/2023	cs	2023-03-08	H3	2023-05-15	2023-05-26		SIAT1	2a.1b	2023-06-21	17820177			Normal inhibition	Normal inhibition	
A/Estonia/173616/2023	cs	2023-03-06	H3	2023-05-15	2023-05-26		cs	2a.1b	2023-06-21	17820189			Normal inhibition	Normal inhibition	
A/Estonia/173616/2023	cs	2023-03-06	H3	2023-05-15	2023-05-26		SIAT1	2a.1b	2023-06-21	17820178			Normal inhibition	Normal inhibition	
A/Estonia/173645/2023	cs	2023-03-02	H3	2023-05-15	2023-05-26		cs	2a.1b	2023-06-21	17820182			Normal inhibition	Normal inhibition	
A/Estonia/173645/2023	cs	2023-03-02	H3	2023-05-15	2023-05-26		SIAT1	2a.1b	2023-07-20	18008505			Normal inhibition	Normal inhibition	
A/Estonia/173578/2023	cs	2023-02-25	H3	2023-05-15	2023-05-26		cs	2a.1b	2023-06-21	17820179			Normal inhibition	Normal inhibition	
A/Estonia/173578/2023	cs	2023-02-25	H3	2023-05-15	2023-05-26		SIAT1	2a.1b	2023-07-20	18008507			Normal inhibition	Normal inhibition	
A/Estonia/173486/2023	cs	2023-02-19	H3	2023-05-15	2023-05-26		cs	2a.1b	2023-06-21	17820183			Normal inhibition	Normal inhibition	
A/Estonia/173486/2023	cs	2023-02-19	H3	2023-05-15	2023-05-26		SIAT1	2a.1b	2023-07-20	18008499			Normal inhibition	Normal inhibition	
A/Estonia/173486/2023	cs	2023-02-19	H3	2023-05-15	2023-05-26	sequence not submitted	SIAT2	2a.1b					Normal inhibition	Normal inhibition	
A/Estonia/KL283/2023	cs	2023-02-15	H3	2023-05-15	2023-05-26		cs	2b	2023-06-21	17820184			Normal inhibition	Normal inhibition	
A/Estonia/KL283/2023	cs	2023-02-15	H3	2023-05-15	2023-05-26		SIAT1	2b	2023-07-27	18044315			Normal inhibition	Normal inhibition	
A/Estonia/173489/2023	cs	2023-02-14	H3	2023-05-15	2023-05-26		cs					no sequence			
A/Estonia/173489/2023	cs	2023-02-14	H3	2023-05-15	2023-05-26		SIAT1					no sequence			
A/Estonia/173253/2023	cs	2023-02-02	H3	2023-05-15	2023-05-26		cs	2b	2023-06-21	17820185			Normal inhibition	Normal inhibition	
A/Estonia/173253/2023	cs	2023-02-02	H3	2023-05-15	2023-05-26		SIAT1	2b	2023-07-20	18007339			Normal inhibition	Normal inhibition	
A/Estonia/173181/2023	cs	2023-01-30	H3	2023-05-15		Virus not recovered	cs	2a.1b	2023-06-21	17820186					
A/Estonia/173182/2023	cs	2023-01-27	H3	2023-05-15		Virus not recovered	cs					no sequence			
A/Estonia/173171/2023	cs	2023-01-24	H3	2023-05-15		Virus not recovered	cs	2a.1b	2023-06-21	17820187					
A/Estonia/173170/2023	cs	2023-01-24	H3	2023-05-15		Virus not recovered	cs	2b	2023-06-21	17820188					
A/Estonia/173097/2023	cs	2023-01-23	H3	2023-05-15	2023-05-26		cs					no sequence	Normal inhibition	Normal inhibition	
A/Estonia/173097/2023	cs	2023-01-23	H3	2023-05-15	2023-05-26		SIAT1	2b	2023-07-20	18007338			Normal inhibition	Normal inhibition	
A/Estonia/173033/2023	cs	2023-01-17	H3	2023-05-15	2023-05-26		cs	2b	2023-06-21	17820180			Normal inhibition	Normal inhibition	
A/Estonia/173033/2023	cs	2023-01-17	H3	2023-05-15	2023-05-26		SIAT1	2b	2023-07-20	18007337			Normal inhibition	Normal inhibition	

## Summary of the latest WHO Influenza Vaccine Composition meetings

Genetic and antigenic characterization data generated at the Worldwide Influenza Centre for viruses with collection dates after 31 January 2023 until 31 August 2023 informed the WHO influenza vaccine composition meeting (VCM) in September 2023 when recommendations were made for the southern hemisphere (SH) 2024 influenza season. At the September 2023 VCM it was recommended to change the A(H1N1)pdm09 and A(H3N2) vaccine components for the 2024 SH season. Previously, at the February 2023 VCM, which focused on data from viruses collected after 31 August 2022 until 31 January 2023, it was also recommended to change the A(H1N1)pdm09 vaccine component for the 2023-2024 northern hemisphere (NH) season.

It was recommended that vaccines for use in the 2024 southern hemisphere influenza season contain the following:

Trivalent: Egg-based Vaccines

- an A/Victoria/4897/2022 (H1N1)pdm09-like virus;
- an A/Thailand/8/2022 (H3N2)-like virus; and
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus.

Trivalent: Cell- or recombinant-based Vaccines

- an A/Wisconsin/67/2022 (H1N1)pdm09-like virus;
- an A/Massachusetts/18/2022 (H3N2)-like virus; and
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus.

Quadrivalent: egg- or cell culture- or recombinant-based vaccines

Above 3 components; and a B/Phuket/3073/2013 (B/Yamagata lineage)-like virus.

It was recommended that vaccines for use in the 2023-24 northern hemisphere influenza season contain the following:

Trivalent: Egg-based Vaccines

- an A/Victoria/4897/2022 (H1N1)pdm09-like virus;
- an A/Darwin/9/2021 (H3N2)-like virus; and
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus.

Trivalent: Cell- or recombinant-based Vaccines

- an A/Wisconsin/67/2022 (H1N1)pdm09-like virus;
- an A/Darwin/6/2021 (H3N2)-like virus; and
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus.

Quadrivalent: egg- or cell culture- or recombinant-based vaccines

Above 3 components; and a B/Phuket/3073/2013 (B/Yamagata lineage)-like virus.

# ANNEX

## Genetic clade classification of recent seasonal viruses

### *Influenza type A viruses*

#### **A(H1N1)pdm09**

All A(H1N1)pdm09 viruses detected recently descend from **6B.1A.5a**. The new nomenclature drops the prefix 6B.1A. Clade **5a** has split into two antigenically distinct clusters:

- **Clade 5a.1**
  - signature amino acid substitutions D187A, Q189E
  - Vaccine virus: A/Guangdong-Maonan/SWL1536/2019

Signature amino acid substitutions are described against A/Guangdong-Maonan/SWL1536/2019 from here onwards.

- **Clade 5a.2**
  - signature amino acid substitutions K130N, N156K, A187D, L161I and V250A
  - Vaccine virus: A/Victoria/2570/2019
  - **Clade 5a.2a**
  - signature amino acid substitutions Clade 5a.2 + K54Q, A186T, E224A, R259K and K308R
  - Vaccine virus: A/Sydney/5/2021
    - **Clade 5a.2a.1**
      - signature amino acid substitutions Clade 5a.2a + P137S, K142R, D260E, T277A
      - Vaccine virus: A/Wisconsin/67/2022
      - **Subclade with T216A.** Vaccine virus: A/Victoria/4897/2022

## A(H3N2)

All viruses detected recently belong to clade **3C.2a1b.2a** which has split into two clades, 3C.2a1b.2a.1 and 3C.2a1b.2a.2. The new nomenclature drops the prefix 3C.2a1b.2a, renaming these clades as **1** and **2**. Gain/Loss of glycosylation is represented by +CHO/-CHO.

- **Clade 1**
  - Signature amino acid substitutions G186S, S198P
  - Reference virus: A/Tasmania/503/2020
  - **Clade 1a**
    - Signature amino acid substitutions Clade 1 + K171N
    - Vaccine virus: A/Cambodia/e0826360/2020

Signature amino acid substitutions are described against A/Cambodia/e0826360/2020 from here onwards

- **Clade 1a.1**
  - Signature amino acid substitutions Clade 1a + I48T
  - Reference virus: A/Guizhou-Liuzhite/326/2022
- **Clade 2**
  - Signature amino acid substitutions Y159N, T160I (-CHO), L164Q, N171K, S186D, D190N, P198S
  - Reference virus: A/Norway/29511/2021
  - **Clade 2a**
    - Signature amino acid substitutions Clade 2 + H156S
    - Vaccine virus: A/Darwin/9/2021
    - **Clade 2a.1**
      - Signature amino acid substitutions Clade 2a + D53G, D104G, K276R
      - Reference virus: A/Slovenia/8720/2022
      - **Clade 2a.1a**
        - Signature amino acid substitutions Clade 2a.1 + L157I
        - Reference virus: A/Maryland/02/2021
      - **Clade 2a.1b**
        - Signature amino acid substitutions Clade 2a.1 + I140K, R299K
        - Reference virus: A/Catalonia/NSVH161512067/2022
    - **Clade 2a.2**
      - Signature amino acid substitutions Clade 2a + D53G, R201K, S219Y
      - Reference virus: A/Poland/97/2022
    - **Clade 2a.3**
      - Signature amino acid substitutions Clade 2a + D53N, N96S (+CHO), I192F
      - Reference virus: A/Norway/24873/2021
      - **Clade 2a.3a**
        - Signature amino acid substitutions Clade 2a.3 + E50K
        - Reference virus: A/Finland/402/2023
        - **Clade 2a.3a.1**
          - Signature amino acid substitutions Clade 2a.3a + I140K, I223V
          - Vaccine virus: A/Thailand/8/2022
      - **Clade 2a.3b**
        - Signature amino acid substitutions Clade 2a.3 + I140M
        - Reference virus: A/Sydney/732/2022
  - **Clade 2b**
    - Signature amino acid substitutions Clade 2 + E50K, F79V, I140K
    - Reference virus: A/Thuringen/10/2022

## ***Influenza type B viruses***

### **B/Victoria/2/87 lineage**

Signature amino acid substitutions are described against B/Brisbane/60/2008.

In recent months, only viruses derived from **clade V1A.3a.2** have circulated.

- **Clade V1A.3**
  - Signature amino acid substitutions I117V, N129D, K136E, del(162-164)
  - Vaccine virus: B/Washington/02/2019
  - **Clade V1A.3a**
    - Signature amino acid substitutions Clade V1A.3 + N150K, G184E, N197D (+CHO) and R279K
    - Reference virus: B/Croatia/7789/2019
    - **Clade V1A.3a.1**
      - Signature amino acid substitutions Clade V1A.3a + V220M, P241Q
      - Reference virus: B/Cote d'Ivoire/948/2020
    - **Clade V1A.3a.2**
      - Signature amino acid substitutions Clade V1A.3a + A127T, P144L, N150K, G184E, N197D(-CHO), K203R, R279K
      - Vaccine virus: B/Austria/1359417/2021
      - **Subclade with D197E, E183K.** Reference virus: B/Connecticut/01/2021
      - **Subclade with D197E, E183K.** Reference virus: B/Catalonia/2279261NS/2023
      - **Subclade with E128K, A154E, S208P.** Reference virus: B/Moldova/2030521/2023

### **B/Yamagata/16/88 lineage**

Genetic clade Y3 viruses, represented by the vaccine virus B/Phuket/3073/2013, have circulated in recent years. However, very few detections have been reported recently and no viruses with collection dates after March 2020 have been made available for detailed characterisation.