CORRECTION





Correction: antigenic drift and immunity gap explain reduction in protective responses against influenza A(H1N1)pdm09 and A(H3N2) viruses during the COVID-19 pandemic: a cross-sectional study of human sera collected in 2019, 2021, 2022, and 2023

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Correction: Fossum et al. Virology Journal (2024) 21:57 https://doi.org/10.1186/s12985-024-02326-w.

Following the publication of the original article [1], the author reported that the figures had been mistakenly reordered during publication:

Fig. 1 was presented as Fig. 4

- Fig. 2 was presented as Fig. 5
- Fig. 3 was presented as Fig. 1
- Fig. 4 was presented as Fig. 2; and
- Fig. 5 was presented as Fig. 3.

The correct order is as follows:

The legends shown in the Original Article are correct for all the figures.

The original article [1] has been corrected.

The online version of the original article can be found at https://doi. org/10.1186/s12985-024-02326-w.

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Fig. 1 Influenza epidemics in Norway from October 2016 to May 2023. A) The number of laboratory confirmed influenza A and B infections were extracted from the Norwegian influenza surveillance data generated by NIPH and the regional laboratories. B) The proportions of A(H1N1)pdm09 and A(H3N2) among influenza A infections were estimated from patient samples tested against both subtypes, and these weekly frequencies extrapolated to the total number of detected influenza A infections. Each influenza season is indicated with a start in week 40 and end in week 25 the following year.



Fig. 2 Protective antibodies against influenza A in sera from 2019, 2021, 2022 and 2023. Residual sera collected in August 2019 (n = 1054), 2021 (n = 657), 2022 (n = 1197) and 2023 (n = 456) were evaluated in HAI assay against **A**) H1N1pdm09 strains A/Michigan/45/2015, A/Brisbane/2/2018 or A/Victoria/2570/2019 or **B**) H3N2 strains A/Singapore/19/2016, A/Kansas/14/2017, A/Cambodia/e0826360/2020 or A/Darwin/9/2021. Sera were considered protective if HAI titers were ≥ 40 , and the percentage of protective-titre sera plotted in different age groups



Fig. 3 HAI titers against H1N1pdm09 A/Victoria/2570/2019 in sera from 2021 and 2022 in different age groups. **A**) Reverse cumulative plots were generated from the HAI titers against A/Victoria/2570/19 from 2021 and 2022 for the age groups 0–4 years, 5–14 years, 15–24 years, 25–59 years and 60 + years. The dotted line indicates 50% protective HAI titer of 40. **B**) Number of detected influenza A infections per 100.000 individuals in the different age groups for the period week 40 2022 to week 22 2023. **C**) Vaccine coverage in the general population obtained from the Norwegian Immunization Registry SYSVAK for the different age groups. **D**) Reverse cumulative plots of HAI titers in a panel of 119 sera collected in 2021 and first tested against A/Victoria/2570/2019 in 2021 and repeat tested in 2022 to verify reproducibility. A) Significant differences were calculated by a two-tailed Mann-Whitney test. ****** = p < 0.01, ******* = p < 0.001 and ******** = p < 0.0001, ns = no significant difference



Fig. 4 HAI titers against A/Darwin/9/2021 (H3N2) in sera from 2021 and 2022 in different age groups. **A**) Reverse cumulative plots were generated from the HAI titers against A/Darwin/9/2021 from 2021 and 2022 for the age groups 0–4 years, 5–14 years, 15–24 years, 25–59 years and 60+years. The dotted line indicates 50% protective HAI titer of 40. **B**) Number of detected influenza A infections per 100.000 individuals in the different age groups were extracted from the Norwegian Laboratory Database for the period week 1 2022 to week 26 2022. **C**) Reverse cumulative plots of HAI titers in sera from one reference lab tested against A/Darwin/9/2021 in both 2021 and 2022. Significant differences were calculated by a two-tailed Mann-Whitney test. ******* = p < 0.001 and ns = no significant difference

а



b



Fig. 5 Reduced HAI titers against A(H1N1)pdm09 clade 6B.1A.5a.2a.1 in 2022. **A**) Maximum parsimony tree of HA sequences of Norwegian A(H1N1) pdm09 strains from the 2022/2023 influenza season, including reference strains and vaccine strains for the southern and northern hemisphere. **B**) Residual serum samples from August 2022 with HAI titer of \geq 160 against A/Victoria/2570/2019 (clade 6B.1A.5a.2) were evaluated in an HAI assay against the A(H1N1)pdm09 clade 6B.1A.5a.2a.1 strain A/Norway/25089/2022. **B**) Data presented is geometric mean with error bars representing 95% confidence interval. Significance was determined using a Wilcoxon matched-paired signed rank test. ** = p < 0.001, *** = p < 0.001 and**** = p < 0.001

Published online: 18 March 2024

References

1. Fossum E, Rohringer A, Aune T, et al. Antigenic drift and immunity gap explain reduction in protective responses against influenza A(H1N1)pdm09 and A(H3N2) viruses during the COVID-19 pandemic: a cross-sectional study of human sera collected in 2019, 2021, 2022, and 2023. Virol J. 2024;21:57. https://doi.org/10.1186/s12985-024-02326-w.

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