Immunogenicity of COVID-19 bivalent boosters in healthcare workers

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INTRODUCTION

- Waning immune responses and continuous evolution of SARS-CoV-2 contribute to reduced vaccine effectiveness over time.
- Bivalent vaccines incorporating the Omicron spike (S) protein were introduced to redirect the immune response to antigenically distinct variants.
- **AIM:** To assess immunogenicity of Omicron BA.1 and BA.5 bivalent booster vaccinations in individuals primed with either adenovirus-based (Ad26.COV2.S) or mRNA-based vaccines (BNT162b2 or mRNA-1273).

METHODS

Patient population

- 434 healthcare workers were recruited
- Randomised equally to the direct boost group (received BA.1 bivalent booster in October 2022) or postponed boost group (received BA.5 bivalent booster in December 2022)

Data collection

- Blood samples were collected at day 0 (pre-boost), 7 and 28 days, then 3-, 6- and 12-month following booster.

Immunological assay

- S1-specific binding antibodies were measured by Liaison SARS-CoV-2 TrimericS IgG assay
- Neutralising antibodies were measured using plaque reduction neutralising test (PRNT)
- T-cell response was quantified using an interferon-gamma release assay (IGRA) in whole blood

RESULTS

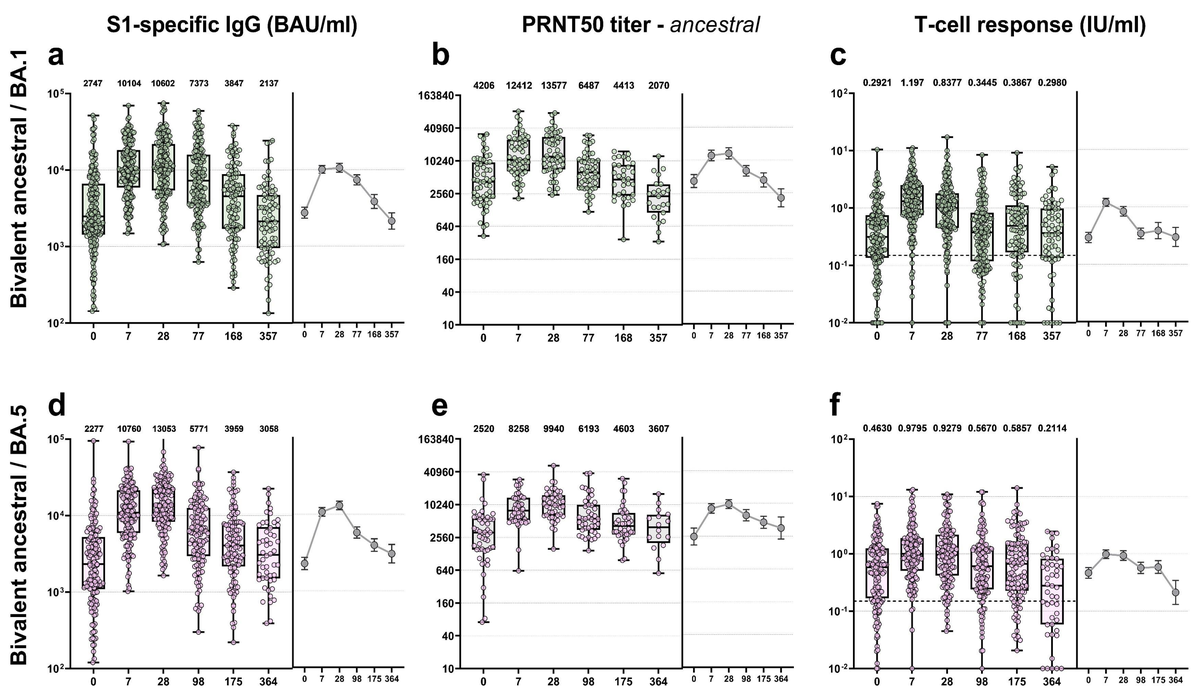

Figure 1. S1-specific binding antibodies, neutralising antibodies and T-cell responses following bivalent boosters. All three parameters rapidly increased in the first 28 days for both groups regardless of the booster types. Immune responses to ancestral SARS-CoV-2 waned at 3- and 6-month then returned to baseline level at 12-month point.

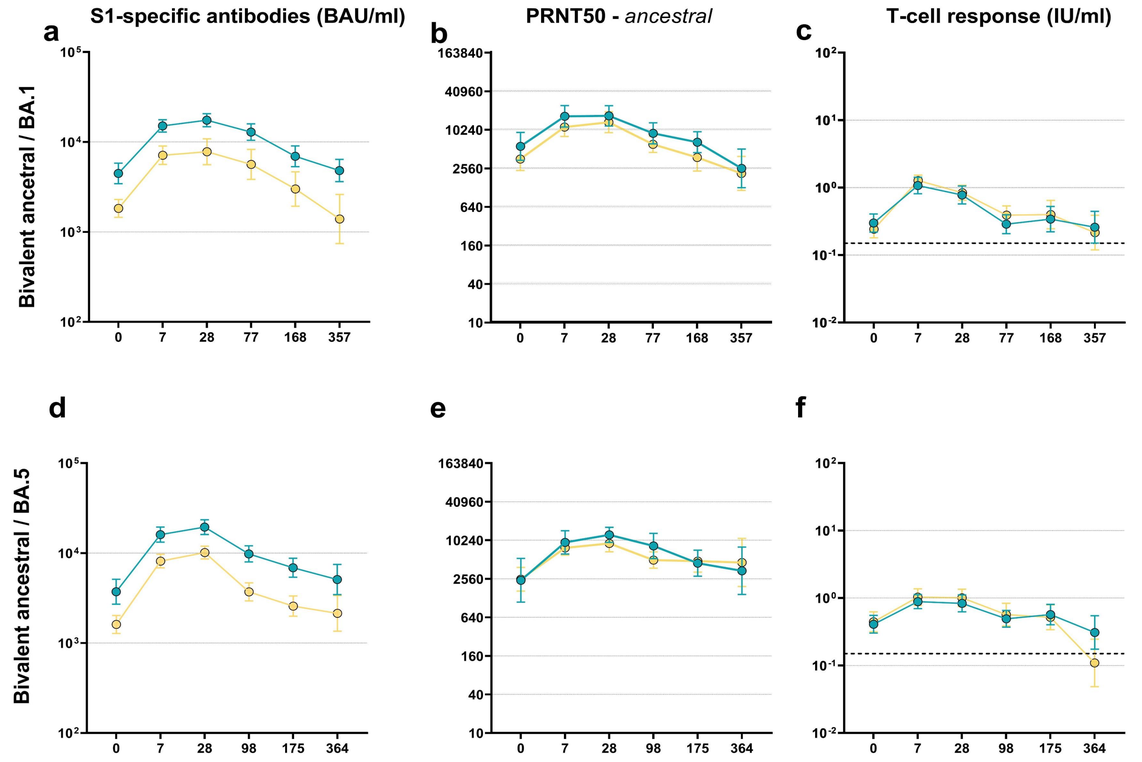

Figure 2. S1-specific binding antibodies, neutralising antibodies and T-cell responses following bivalent booster vaccination in participants who received different primings. Different primings are colour-coded (yellow = adeno-prime, blue = mRNA-prime). Regardless of priming, S1-specific antibodies and neutralising antibodies displayed similar kinetics. Higher S1-specific biding antibodies were detected in mRNA-primed individuals compared to Ad26.COV2.S-primed individuals, but this was not observed for ancestral neutralising and T-cell responses.

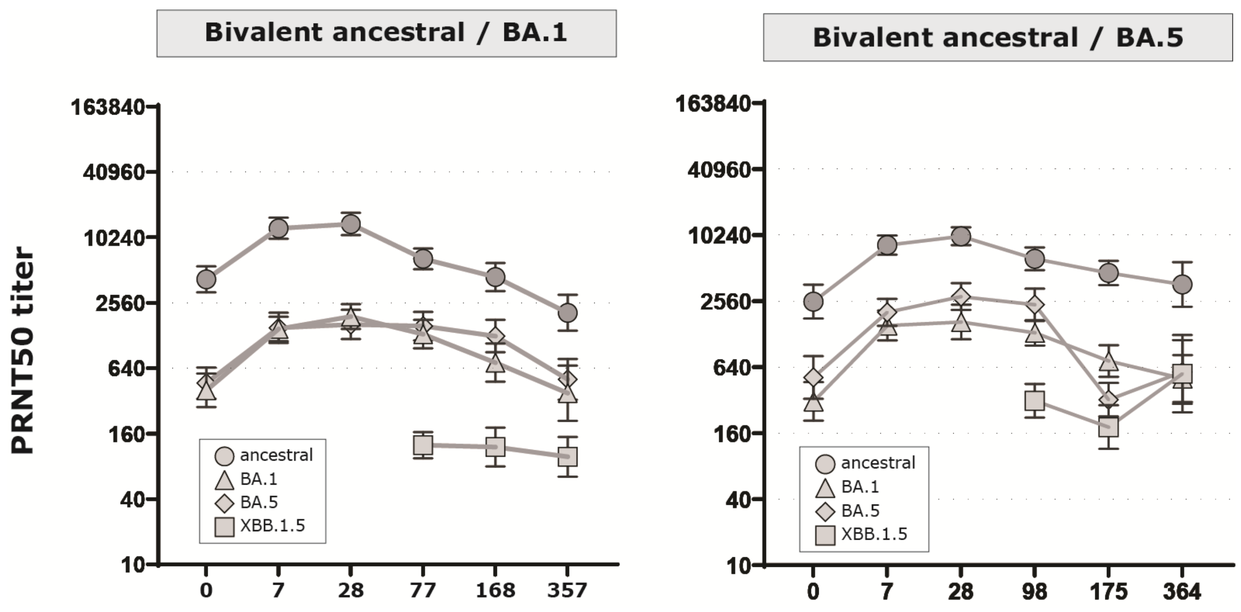

Figure 3. Neutralising antibodies against different variants. Neutralising antibodies against the whole virus were measured for both boost groups. Neutralising antibodies against ancestral strain were higher than neutralising antibodies against other variants at all time points suggesting the presence of immunological imprinting.

CONCLUSION

- Rapid recall of immunological memory following bivalent boosters
- In mRNA-primed individuals, S1-specific binding antibodies were detected at higher levels compared to adeno-primed individuals across all time point. Levels of neutralising antibody showed a slight difference while T-cell responses were similar between the two primings.
- Limited XBB.1.5 cross-neutralising antibodies were detected.
- Our data emphasise the importance of continuous surveillance of circulating variants and immune response assessment towards variants of concern.