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Supplemental information

Beta-spike-containing boosters induce robust and functional antibody responses to SARS-CoV-2 in macaques primed with distinct vaccines

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Supplementary Information

Supplemental items

Figure S1 -S5

Figure S1

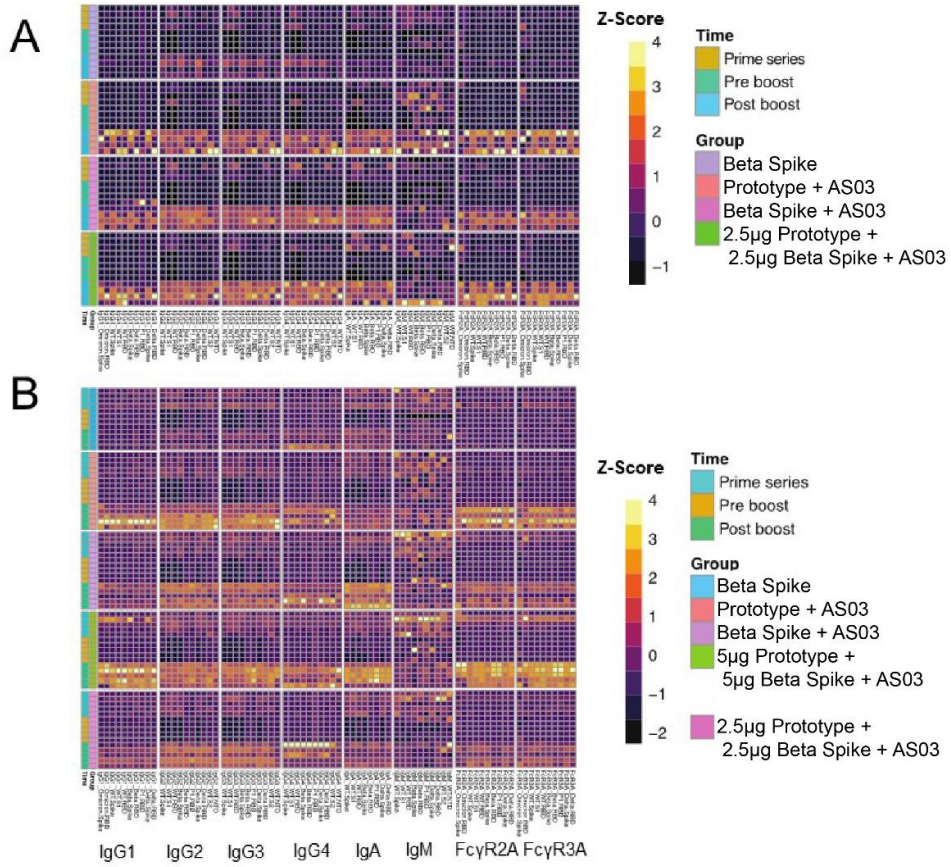

Figure S1: Heatmaps of antibody responses. Antibody binding heatmap profiles against ancestral WT and VOC spike antigens at all time points in (A) mRNA prime cohort and (B) protein prime cohort. All values are z-scored within each cohort.

Figure S2

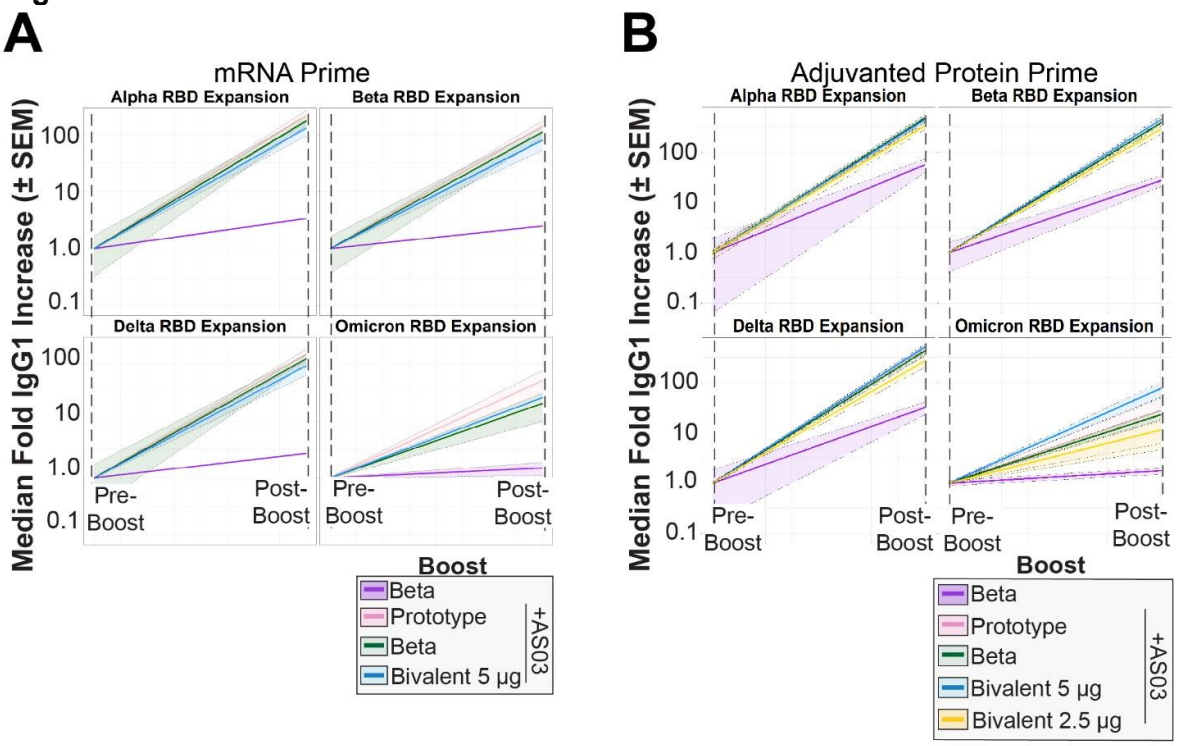

Figure S2. Protein-boosters with AS03 expand IgG1 recognition of RBD in a variant of concern-independent manner. (A) Fold expansions of antibodies against the Alpha, Beta, Delta, and Omicron VOC for the boosted mRNA primed cohort. Pre-Boost time points were standardized to 1 across boosting strategies (color legend shown in the bottom right) and post-boost increases were plotted relative to their pre-boost values. The median fold increases (solid, colored line), and the standard error of the mean (SEM, shaded region of the same color) are shown. (B) Same as A, but for the protein-primed cohort. Note that this cohort has two bivalent groups distinguished by the amount of protein in the dose (blue = 5 µg and gold = 2.5 µg).

Figure S3

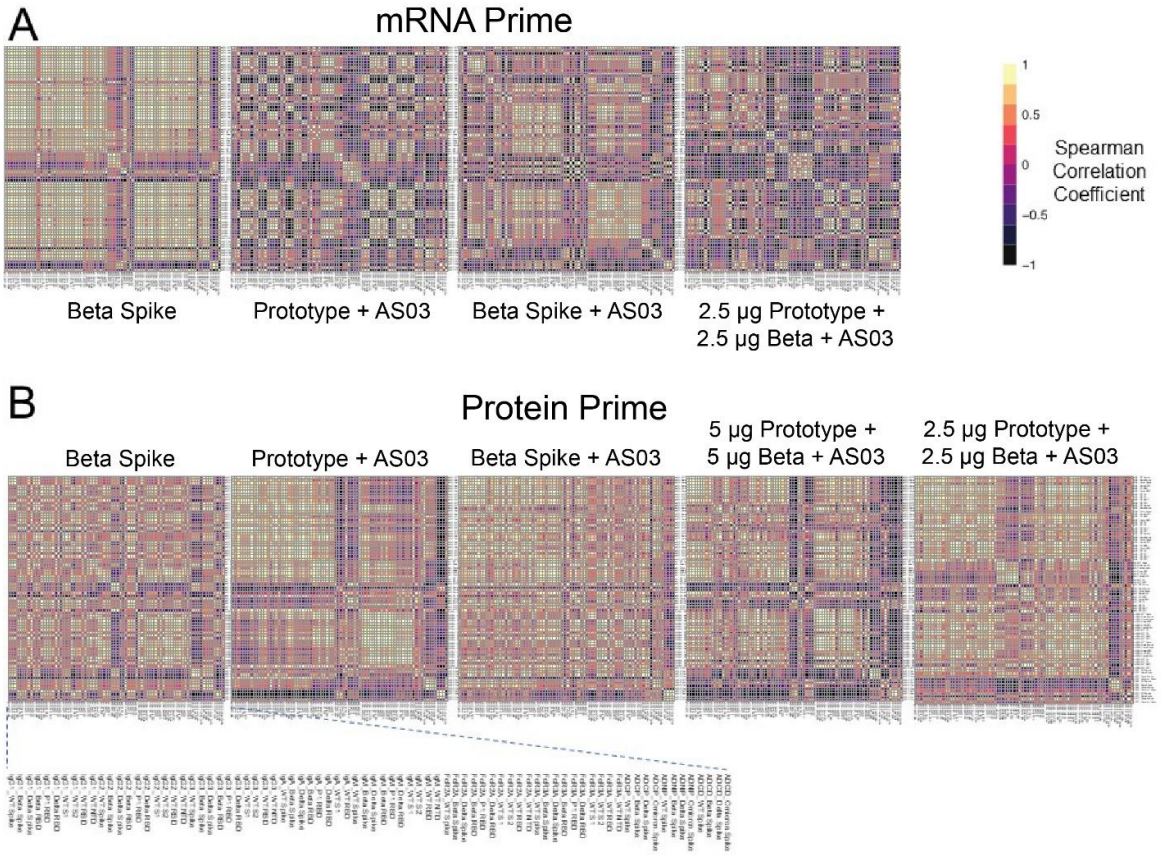

Figure S3: Spearman correlation heatmap for antibody responses. Correlation values were plotted against ancestral, Beta, Gamma (P1), Delta, and Omicron spike antigens at post-booster timepoint in (A) mRNA prime cohort and (B) protein prime cohort. A correlation heatmap legend is shown on the right.

Figure S4

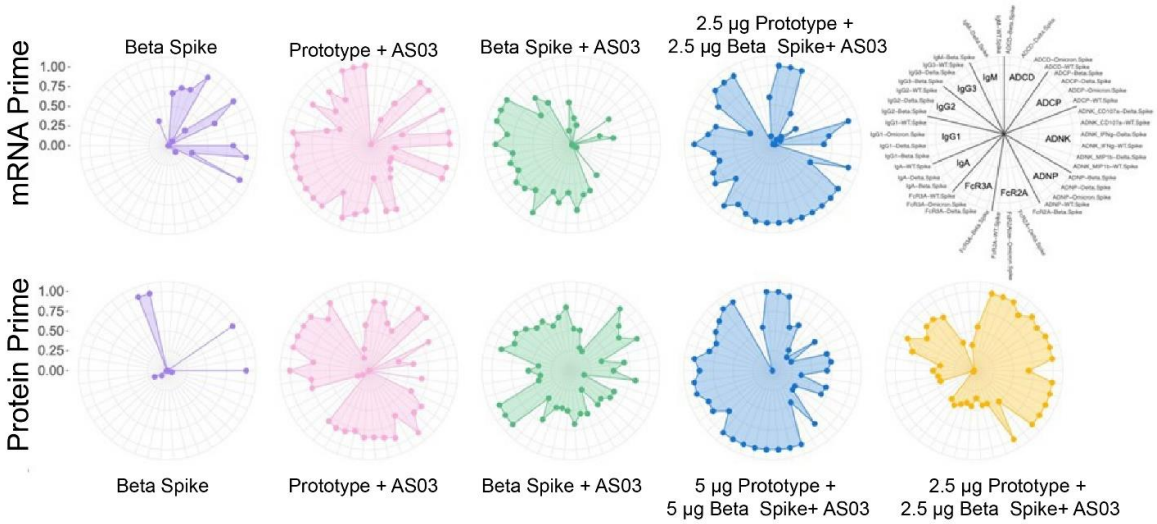

Figure S4. Radar plot of the spike specific-antibody responses at post booster time point. (A) Median ranked percentiles of antibody titers (IgA, IgG1, IgG2, IgG3, IgM), FcγR-binding titers (FcγRIIA and FcγRIIIA), and antibody-dependent functional scores (ADCP, ADCP, ADNK, ADNP) against the ancestral, Beta, Delta, and Omicron spike antigens for the mRNA primed cohort. (B) Median ranked percentiles of antibody titers (IgA, IgG1, IgG2, IgG3, IgM), FcγR-binding titers (FcγRIIA and FcγRIIIA), and antibody-dependent functional scores (ADCP, ADCP, ADNK, ADNP) against the ancestral, Beta, Delta, and Omicron spike antigens for the protein primed cohort.

Figure S5

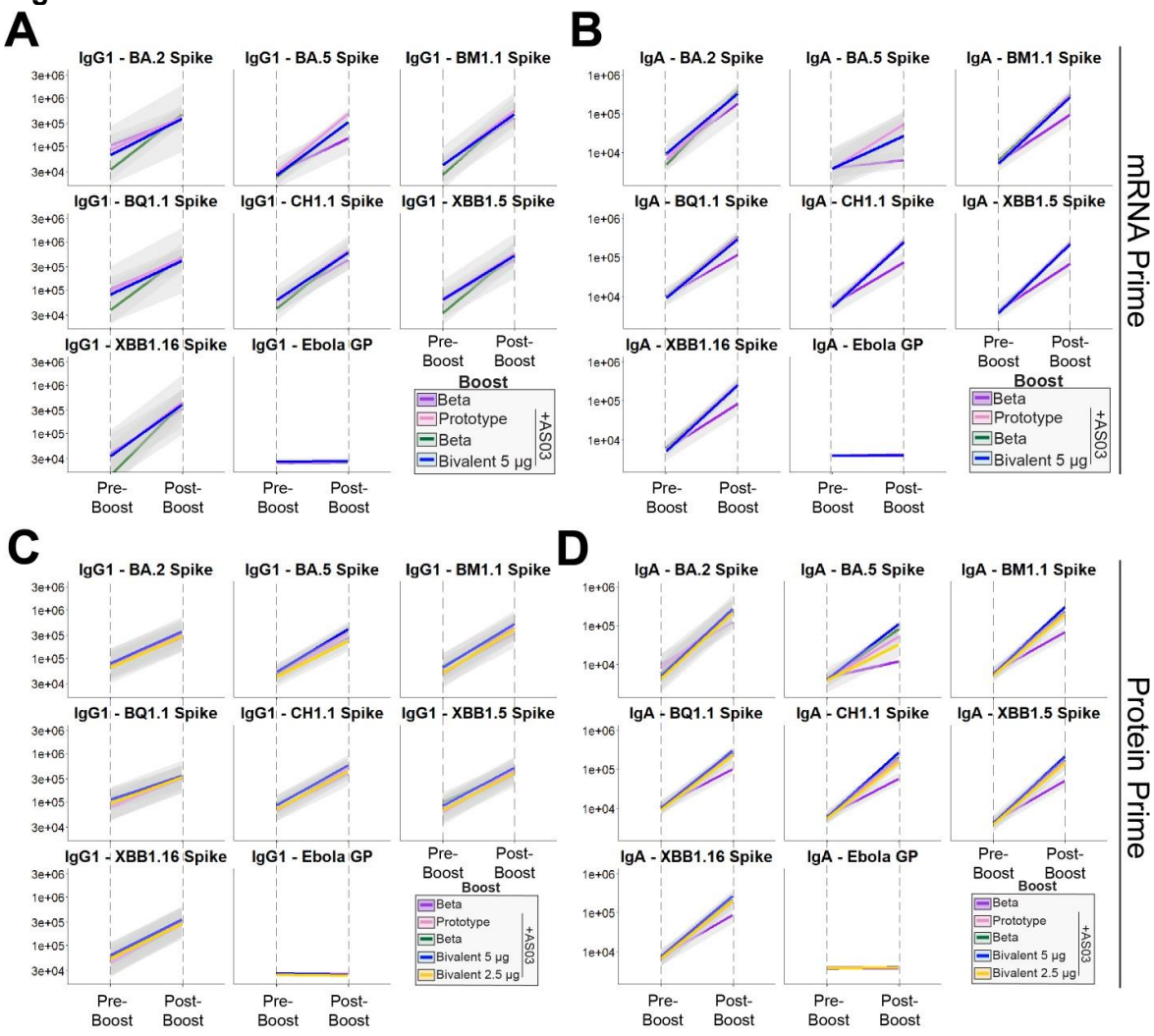

Figure S5. Subunit-based boosters increase IgG1 and IgA recognition of distal Omicron-lineage Spikes. (A) mRNA primed macaques were boosted with the indicated subunit-based vaccine and IgG1 responses against Omicron-lineages Spikes including BA.2, BA.5, BM.1.1, BQ.1.1, CH.1.1, XBB.1.5, and XBB.1.16 were plotted. Ebola Gp was used as a negative antigen control. Shown on the bottom right is the color scale legend. (B) Same as (A), but for IgA responses. The y-axis scaling is different between A and B as IgA responses showed greater sensitivity against the Omicron-lineage Spikes. (C) Protein-primed macaques were boosted with the indicated subunit-based vaccine and IgG1 responses against Omicron-lineages Spikes including BA.2, BA.5, BM.1.1, BQ.1.1, CH.1.1, XBB.1.5, and XBB.1.16 were plotted. Ebola Gp was used as a negative antigen control. Shown on the bottom right is the color scale legend. (D) Same as (C), but for IgA responses. The y-axis scaling is different between C and D as IgA responses showed greater sensitivity against the Omicron-lineage Spikes.