ADVANCED HEALTHCARE MATERIALS

Supporting Information

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A modular biomaterial scaffold-based vaccine elicits durable adaptive immunity to subunit SARS-CoV-2 antigens

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Supporting Information

A rapidly adaptable biomaterial vaccine for SARS-CoV-2

Fernanda Langellotto[1†], Maxence O. Dellacherie[1,2†], Chyenne Yeager[1†], Hamza Ijaz[1], Jingyou Yu[3], Chi-An Cheng[1,6,7], Nikolaos Dimitrakakis[1], Benjamin T. Seiler[1], Makda S. Gebre[3], Tal Gilboa[1,6,7], Rebecca Johnson[8], Nadia Storm[8], Sarai Bardales[1], Amanda Graveline[1], Des White[1], Christina M. Tringides[1,9,10], Mark J. Cartwright[1], Edward J. Doherty[1], Anna Honko[8], Anthony Griffiths[8], Dan H. Barouch[3,4,5], David R. Walt[1, 6,7], David J. Mooney[1,2, *]

† These authors contributed equally to this work

List of supplementary figures and tables

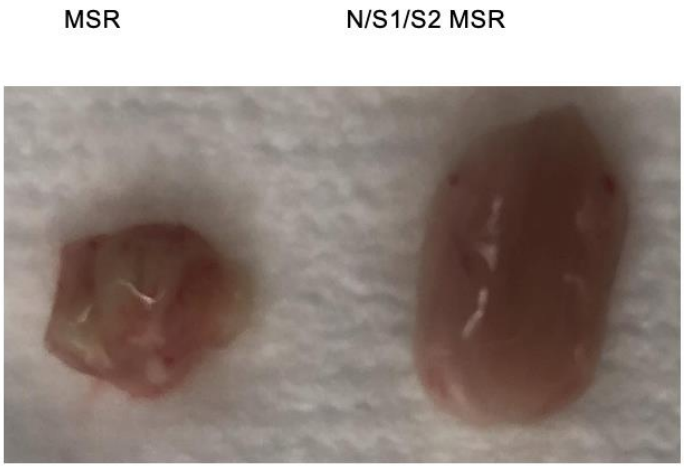

Figure S1: photographs of explanted scaffolds containing only MSR (MSR) or the full SARS-COV-2 MSR vaccine formulated with 1µg of each antigen (N, S1 and S2), 25µg MPLA and 1µg GM-CSF

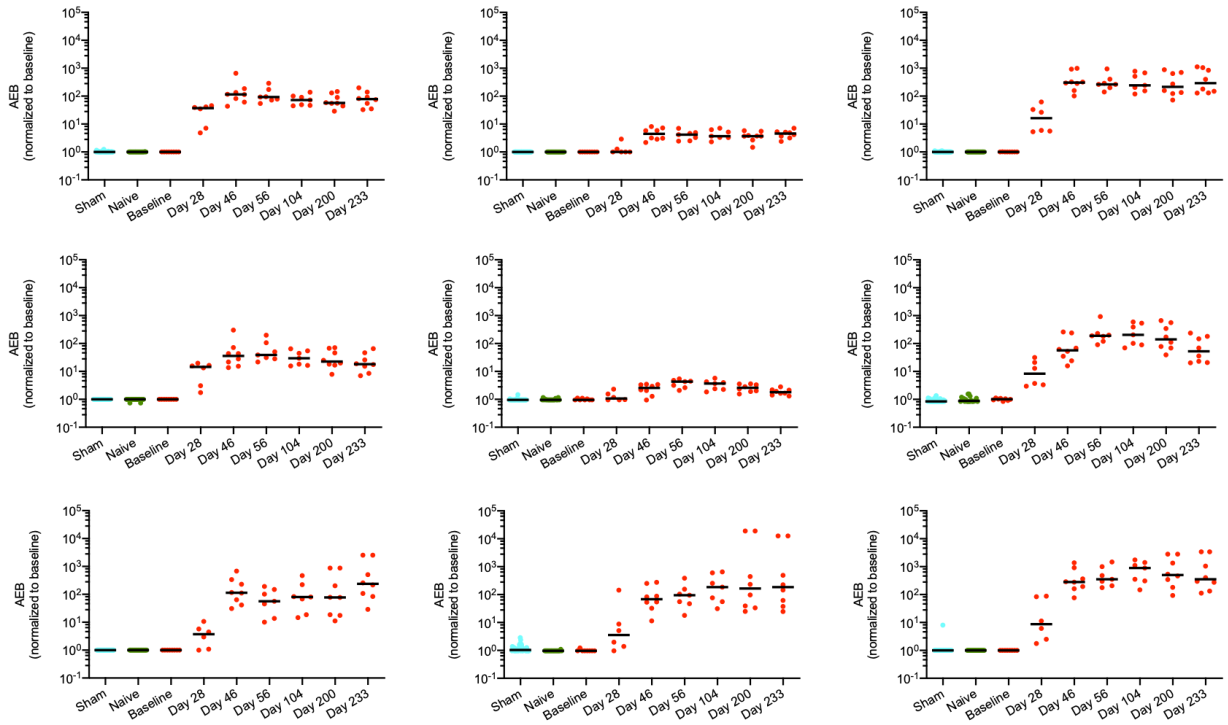

Figure S2: anti - N, S1, S2 protein IgG, IgG1 and IgG2a antibodies measured by Simoa technology. Normalized average number of enzyme labels per bead (AEB) of – from left to right – N, S1, S2-specific antibodies of the – from top to bottom – IgG, IgG1 and IgG2a isotypes.

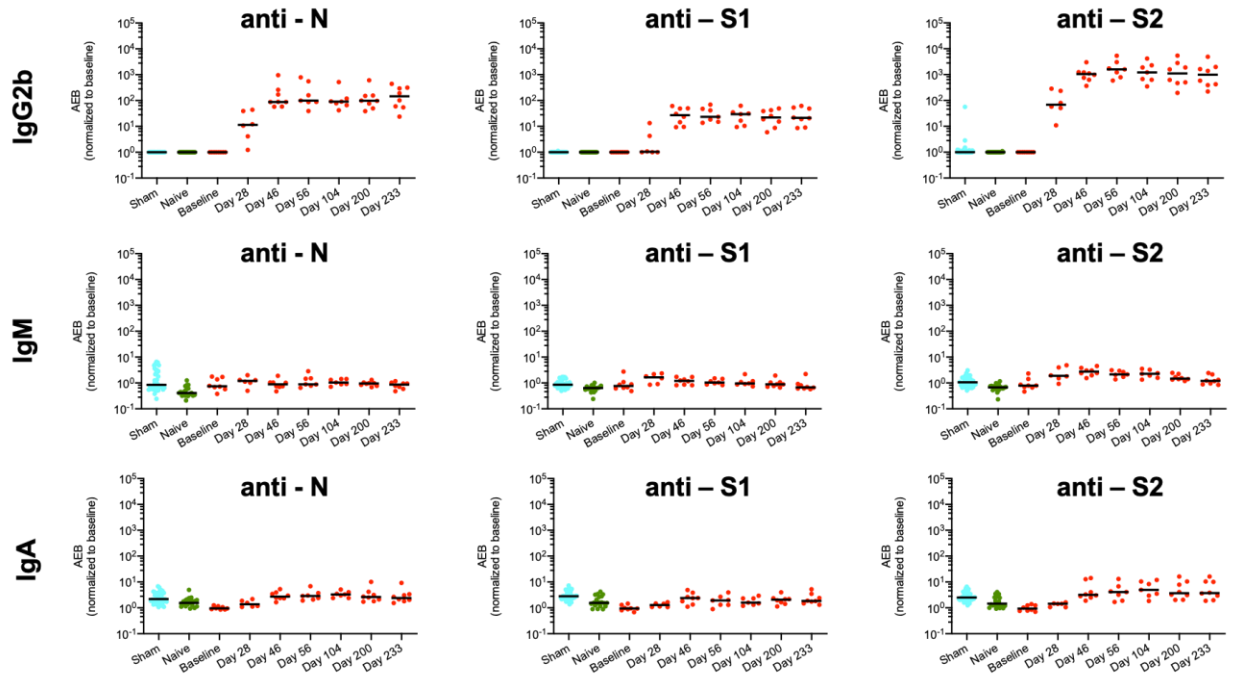

Figure S3: **anti - N, S1, and S2 protein IgG2b, IgM and IgA antibodies measured by Simoa technology.** Normalized average number of enzyme labels per bead (AEB) of – from left to right – N, S1, S2-specific antibodies of the – from top to bottom – IgG2b, IgM and IgA isotypes.

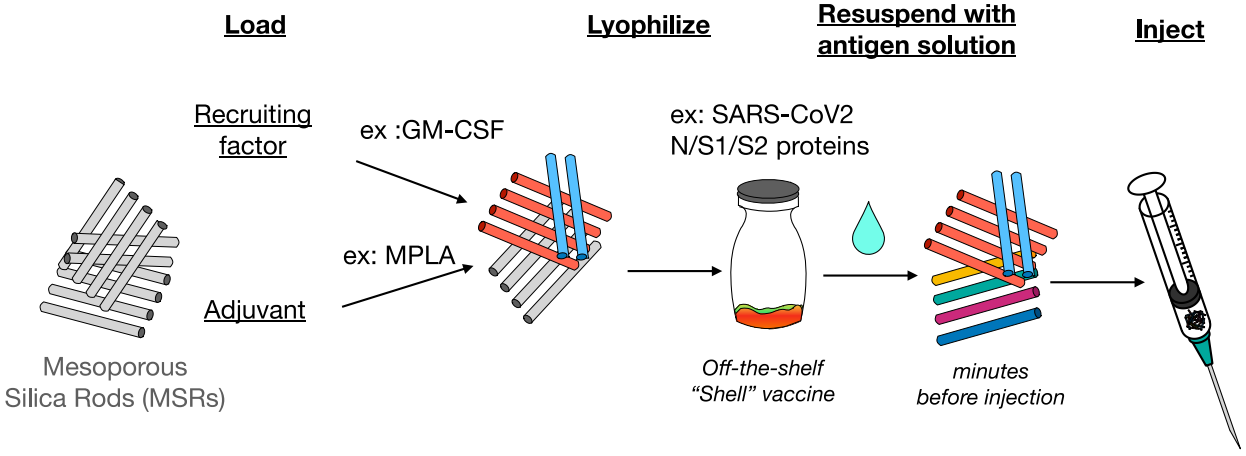

Figure S4: Schematics for "add-in-time" vaccine. Alternatively, an MSR vaccine "Shell" vaccine can be manufactured by solely loading a recruiting factor and adjuvant before lyophilization and storage. Antigen is added "in-time" by resuspending the powder-form MSR vaccine with an antigen solution minutes before injection.

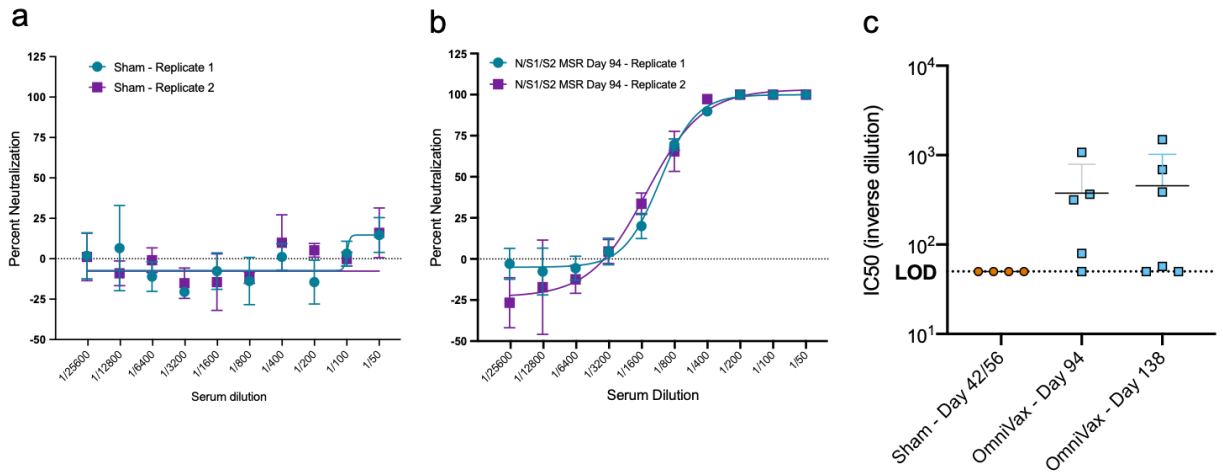

Figure S5: Results from SARS-CoV-2 plaque reduction assay. Plaque reduction (% neutralization) vs serum dilution and its non-linear-fit (full line) used to calculate IC50 is shown for a representative Sham (a) and N/S1/S2 MSR vaccine samples (b). The average of two replicates was used for each sample to determine the IC50 dilution. (c) IC50 from serum of Sham or N/S1/S2 MSR vaccine – immunized mice.

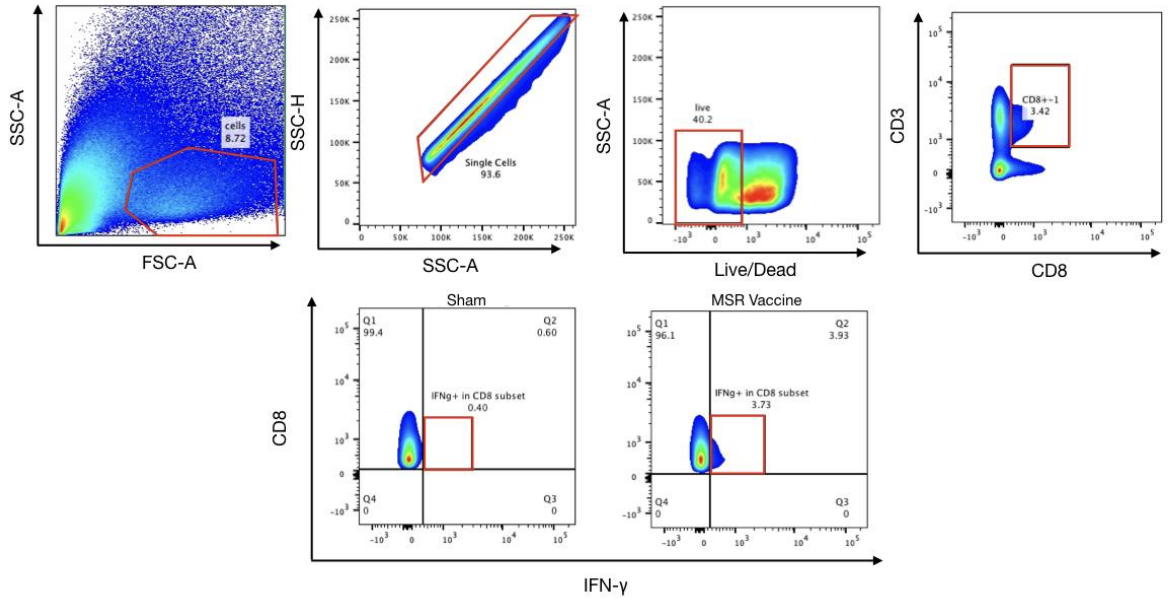

Figure S6: Primary Flow Cytometry gating for specific T cell restimulation assay. Representative flow data gating CD8+ T-cell in splenocytes 28 days after immunization with the MSR vaccine loaded with N/S1/S2 proteins. Gated on live cells.

Number of particles measured	Particle size range (μm)	Average particle length (μm)	Median particle length (μm)	Surface area (m^2/g)	Average pore diameter (nm)	Pore volume (cm^3/g)
907	20-403	65	56	361.9	6.51	0.589

Table S1: Physical characteristics of MSR particles used for vaccination obtained by SEM image analysis and nitrogen sorption analysis