

SUPPLEMENTARY INFORMATION

Supplemental Table 1. List of antibodies used for T cell analyses in this study.

Antigen	Clone	Type	Fluorochrome	Identifier	Source
CCR7	G043H7	Mouse monoclonal	APC Fire 750	353246	BioLegend
CD3	SP34.2	Mouse monoclonal	BV785	563918	BD Biosciences
CD4	L200	Mouse monoclonal	BUV496	750591	BD Biosciences
CD8	RPA-T8	Mouse monoclonal	BUV805	568334	BD Biosciences
CD45RA	5H9	Mouse monoclonal	BV605	740424	BD Biosciences
CD69	FN50	Mouse monoclonal	BUV395	564364	BD Biosciences
CD154	TRAP1	Mouse monoclonal	BUV737	748983	BD Biosciences
CXCR3	G043H7	Mouse monoclonal	PE/Dazzle 594	353736	BioLegend
CXCR5	MU5UBEE	Mouse monoclonal	PE/Cy7	25-9185-42	Thermo Fisher

IFN γ	B27	Mouse monoclonal	FITC	554700	BD Biosciences
IL-2	MQ1-17H12	Rabbit monoclonal	BV421	500328	BioLegend
IL-4	MP4-25D2	Rabbit monoclonal	BB700	567744	BD Biosciences
IL-13	JES10-5A2	Rabbit monoclonal	PE	559328	BD Biosciences
IL-17	N49-653	Mouse monoclonal	BV650	563746	BD Biosciences
IL-21	3A3-N2.1	Mouse monoclonal	AF647	560493	BD Biosciences
PD-1	EH12.1	Mouse monoclonal	BUV661	750260	BD Biosciences
TNF	MAb11	Mouse monoclonal	BV750	566359	BD Biosciences

Supplemental Table 2. List of antibodies used for B cell analyses in this study.

Antigen	Clone	Type	Fluorochrome	Identifier	Source
CD4	SK3	Mouse monoclonal	Spark UV™ 387	344685	BioLegend
CD20	2H7	Mouse monoclonal	BV570	302331	BioLegend
CD14	M5E2	Mouse monoclonal	BV785	301839	BioLegend
CD27	M-T271	Mouse monoclonal	PE/Dazzle™ 594	356421	BioLegend
IgA	Not applicable	Goat IgG	DyLight™ 405	109-475-011	Jackson ImmunoResearch
CD38	OKT10	Mouse monoclonal	PE	4008022	Caprico Biotechnologies
IgD	Not applicable	Goat IgG	FITC	2030-02	Southern Biotech
CD16	3G8	Mouse monoclonal	BUV496	612944	BD Biosciences
IgM	G20-127	Mouse monoclonal	PerCP-Cy™5.5	561285	BD Biosciences
CD21	B-ly4	Mouse monoclonal	PE-Cy™5	551064	BD Biosciences
IgG	G18-145	Mouse monoclonal	Alexa Fluor® 700	561296	BD Biosciences

CD3	SP34-2	Mouse monoclonal	APC-Cy™7	557757	BD Biosciences
CXCR5	MU5UBEE	Mouse monoclonal	PE-Cyanine7	25-9185-42	Thermo Fisher

A

Lymphocytes Single Cells Live cells T cell exclusion Monocyte exclusion B cells Class switched Isotype

SSC-A FSC-H SSC-A CD14 CD3 SSC-A IgD IgG

FSC-A FSC-A Live/Dead CD16 CD4 CD20 IgM IgA

B

pre-vaccination mRNA-native mRNA-VLP

BA.4/5 spike BA.4/5 spike BA.4/5 spike

Delta spike Delta spike Delta spike

C

Singlets Lymphocytes Live T cells CD4⁺ T cells CD8⁺ T cells

FSC-H SSC-A Viability CD4 CCR7 CD45RA

FSC-A FSC-A CD3 CD8

Non-naïve CD4⁺ T cells Exclusion gates Non-naïve CD8⁺ T cells

D

Pre-vaccination Post-vaccination

IFN γ IL-2 TNF α IL-4 IL-13

CD69

FSC, forward scatter; SSC, side scatter; VLP, virus-like particle