

Supplementary Table 1. List of antibodies and dyes used for flow cytometry assays.

	Marker	Clone	Fluorochrome	Dilution	Company	Identifier (Cat # and RRID)
Used for CAR expression	Human IgG (H+L) CAR	Polyclonal	AF647	1:100	Invitrogen	# A-21445 RRID: AB_2535862
	CD3	UCHT1	BV421	1:100	BD Bioscience	# 562426 RRID:AB_11152082
Used for scFv-binding assay	FLAG	Monoclonal	PE	1:500	ProZyme	# PJ315
Used for CAR-T surface marker panel	CD3	SP34-2	BB700	1:200	BD	# 566517 RRID:AB_2744378
	PD-1	EH12.2H7	APC/Cy7	1:200	BioLegend	# 329922 RRID:AB_10933429
	TIM-3	F38-2E2	APC	1:200	BioLegend	# 345012 RRID:AB_2561718
	LAG-3	T47-530	BV421	1:200	BD	# 565720 RRID:AB_2744330
	CD69	FN50	BV510	1:200	BioLegend	# 310936 RRID:AB_2563834
	CD25	BC96	PE	1:200	BioLegend	# 302606 RRID:AB_314276
	AnnexinV	-	PE/Cy7	1:20	BioLegend	# 640950
Used for CAR-T phospho panel	CD3	SP34-2	BB700	1:200	BD	# 566517 RRID:AB_2744378
	Human IgG (H+L) CAR	Polyclonal	AF647	1:100	Invitrogen	# A-21445 RRID: AB_2535862
	Phospho-CD3 zeta	3ZBR4S	PE	1:100	eBioScience	# 12-2478-42 RRID:AB_2744700
Used for CAR-T intra-nuclear panel	CD3	SP34-2	BB700	1:200	BD	# 566517 RRID:AB_2744378
	Fas	DX2	APC/Cy7	1:200	BioLegend	# 305636 RRID:AB_2566111
	Ki67	-	BV421	1:200	BioLegend	# 350506 RRID:AB_2563860
	Nur77	12.14	PE	1:100	eBioScience	# 12-5965-82 RRID:AB_1257209
Used for IL13R α 2 detection	IL13R α 2	Polyclonal	Unconjugated	1:25	R&D	# AF146 RRID:AB_354809
	Goat IgG (H+L)	Polyclonal	AF647	1:200	Invitrogen	# A-21447 RRID:AB_141844
Used for proliferation assay	CD3	UCHT1	PerCP	1:200	BioLegend	# 300427 RRID:AB_893300
Used for HGCC co-culture assay	CD3	SP34-2	BB700	1:200	BD	# 566517 RRID:AB_2744378
	IL13R α 2	Polyclonal	Unconjugated	1:25	R&D	# AF146 RRID:AB_354809
	Goat IgG (H+L)	Polyclonal	AF647	1:200	Invitrogen	# A-21447 RRID:AB_141844
	Live/Dead	-	Fixable viability dye 780	1:2000	BD	# 565388

Supplementary Table S2. List of the significant differentially expressed genes

Feature ID	P-value (CAR[B]-T vs. CAR[E] and Mock-T)	FDR step up (CAR[B]-T vs. CAR[E] and Mock-T)	Ratio (CAR[B]-T vs. CAR[E] and Mock-T)	Fold change (CAR[B]-T vs. CAR[E] and Mock- T)	LSMean(CAR[B]-T) (CAR[B]-T vs. CAR[E] and Mock- T)	LSMean(CAR[E] -T + Mock-T) (CAR[B]-T vs. CAR[E] and Mock-T)
EBI3	4,7E-150	3,6E-147	6,6E+01	6,6E+01	2,1E+03	3,1E+01
CCL1	3,0E-113	1,1E-110	4,2E+02	4,2E+02	1,1E+04	2,6E+01
TFRC	8,5E-57	2,1E-54	3,1E+00	3,1E+00	3,9E+03	1,3E+03
CXCL13	1,7E-56	3,3E-54	4,7E+01	4,7E+01	1,1E+03	2,4E+01
CRLF2	5,0E-53	7,5E-51	8,8E+00	8,8E+00	2,5E+02	2,9E+01
IKZF4	2,6E-47	3,3E-45	4,3E+00	4,3E+00	2,5E+02	5,8E+01
NFKBIA	6,7E-45	7,2E-43	4,6E+00	4,6E+00	6,9E+03	1,5E+03
CD200	7,2E-38	6,8E-36	1,2E+01	1,2E+01	2,8E+02	2,4E+01
TNFRSF9	2,2E-36	1,9E-34	3,2E+01	3,2E+01	1,1E+03	3,6E+01
CCR8	1,5E-35	1,1E-33	1,3E+01	1,3E+01	1,3E+03	1,1E+02
OAS3	6,5E-33	4,5E-31	2,9E+00	2,9E+00	7,1E+02	2,4E+02
MKI67	1,2E-32	7,8E-31	5,8E+00	5,8E+00	4,9E+02	8,4E+01
CASP3	5,7E-32	3,3E-30	1,7E+00	1,7E+00	2,0E+03	1,1E+03
CSF2	1,1E-31	6,0E-30	1,5E+01	1,5E+01	1,2E+03	8,4E+01
PTGER4	2,1E-31	1,1E-29	3,4E+00	3,4E+00	2,3E+03	6,9E+02
NFKB2	3,9E-31	1,8E-29	3,9E+00	3,9E+00	2,7E+03	7,1E+02
TNFRSF18	1,7E-30	7,8E-29	8,6E+00	8,6E+00	8,2E+02	9,5E+01
CCR6	8,0E-30	3,4E-28	1,1E-01	-9,3E+00	4,2E+01	3,9E+02
TNFRSF4	4,2E-28	1,7E-26	5,7E+00	5,7E+00	4,2E+02	7,3E+01
CIITA	8,3E-27	3,1E-25	5,7E+00	5,7E+00	3,8E+02	6,6E+01
NOD2	1,0E-26	3,6E-25	5,7E+00	5,7E+00	4,1E+02	7,2E+01
RORA	2,5E-25	8,6E-24	5,2E-01	-1,9E+00	1,1E+03	2,0E+03
XCL1/2	3,9E-25	1,3E-23	9,7E+00	9,7E+00	3,4E+03	3,5E+02
MTHFD2	9,6E-24	3,0E-22	2,2E+00	2,2E+00	1,6E+03	7,1E+02
HLA-DRA	1,3E-22	3,8E-21	6,4E+00	6,4E+00	2,5E+04	3,9E+03
NEK2	6,0E-22	1,7E-20	4,4E+00	4,4E+00	2,7E+02	6,2E+01
NR3C1	9,0E-22	2,5E-20	2,5E+00	2,5E+00	3,8E+03	1,5E+03
ICAM1	1,8E-21	4,8E-20	2,9E+00	2,9E+00	5,2E+02	1,8E+02
IL15	3,0E-21	7,5E-20	3,2E+00	3,2E+00	1,9E+02	5,9E+01
HIF1A	1,2E-20	2,9E-19	1,8E+00	1,8E+00	3,1E+03	1,7E+03
CCL22	6,5E-20	1,5E-18	1,9E+01	1,9E+01	2,8E+02	1,5E+01
STAT1	4,0E-18	8,6E-17	3,0E+00	3,0E+00	1,5E+04	5,1E+03
SGO2	1,9E-17	4,1E-16	2,3E+00	2,3E+00	1,8E+02	8,0E+01
ICOSLG	2,0E-17	4,2E-16	4,2E+00	4,2E+00	2,8E+02	6,6E+01
USP18	2,2E-17	4,4E-16	2,9E+00	2,9E+00	1,4E+02	5,0E+01
XAF1	2,8E-17	5,4E-16	2,3E+00	2,3E+00	4,0E+02	1,7E+02
BUB1	6,6E-17	1,2E-15	3,2E+00	3,2E+00	4,9E+02	1,5E+02
CD40	7,8E-17	1,4E-15	4,5E+00	4,5E+00	7,9E+01	1,8E+01
CD9	2,6E-16	4,5E-15	5,1E+00	5,1E+00	5,9E+02	1,2E+02

RORC	2,8E-16	4,8E-15	9,9E-02	-1,0E+01	5,1E+01	5,1E+02
CSF2RA	3,1E-16	5,1E-15	4,2E+00	4,2E+00	4,6E+01	1,1E+01
TGFB1	8,8E-15	1,5E-13	5,8E-01	-1,7E+00	2,7E+03	4,6E+03
BCL2L1	1,4E-14	2,2E-13	2,2E+00	2,2E+00	7,6E+02	3,4E+02
IL6ST	1,5E-14	2,4E-13	3,7E+00	3,7E+00	3,2E+03	8,7E+02
LIF	1,8E-14	2,8E-13	3,7E+00	3,7E+00	1,6E+02	4,2E+01
IL21	2,5E-14	3,7E-13	3,5E+00	3,5E+00	6,0E+01	1,7E+01
SHMT2	4,8E-14	6,9E-13	1,6E+00	1,6E+00	1,0E+03	6,6E+02
IL36A	8,5E-14	1,2E-12	5,4E+00	5,4E+00	6,3E+01	1,2E+01
IL13	9,6E-14	1,3E-12	5,3E+00	5,3E+00	6,7E+01	1,3E+01
IKZF2	1,3E-13	1,7E-12	3,4E+00	3,4E+00	2,0E+03	5,9E+02
TCF7	4,7E-13	6,1E-12	2,6E+00	2,6E+00	2,7E+03	1,0E+03
NCAPG2	1,2E-12	1,6E-11	2,3E+00	2,3E+00	4,1E+02	1,8E+02
IFNGR2	5,7E-12	7,0E-11	3,3E+00	3,3E+00	1,1E+02	3,3E+01
SRC	5,7E-12	7,0E-11	2,9E+00	2,9E+00	6,4E+01	2,2E+01
HMGCR	6,1E-12	7,3E-11	1,8E+00	1,8E+00	8,0E+02	4,5E+02
PIK3R3	7,9E-12	9,4E-11	2,2E+00	2,2E+00	1,0E+02	4,8E+01
CEACAM1	8,0E-12	9,4E-11	2,1E+00	2,1E+00	8,3E+01	4,0E+01
MAF	1,1E-11	1,2E-10	2,9E-01	-3,5E+00	2,3E+02	7,9E+02
RPL23	1,8E-11	2,0E-10	6,6E-01	-1,5E+00	3,9E+04	5,9E+04
NSD2	7,5E-11	8,2E-10	1,6E+00	1,6E+00	8,9E+02	5,7E+02
LTA	8,4E-11	9,0E-10	2,4E+00	2,4E+00	1,4E+03	6,1E+02
PRKCB	2,2E-10	2,3E-09	6,1E-01	-1,6E+00	1,1E+03	1,7E+03
MMP9	2,7E-10	2,8E-09	3,7E+00	3,7E+00	6,9E+01	1,9E+01
IFI6	2,8E-10	2,9E-09	1,7E+00	1,7E+00	3,1E+02	1,8E+02
BATF3	3,0E-10	3,0E-09	4,1E+00	4,1E+00	1,8E+02	4,3E+01
CD84	3,3E-10	3,3E-09	2,1E+00	2,1E+00	1,7E+03	8,0E+02
VSIR	3,5E-10	3,4E-09	4,7E-01	-2,1E+00	2,2E+02	4,8E+02
CASP8	4,8E-10	4,6E-09	6,5E-01	-1,5E+00	1,6E+03	2,4E+03
CD276	6,5E-10	6,1E-09	2,9E+00	2,9E+00	3,3E+01	1,2E+01
ACVR1B	6,9E-10	6,4E-09	2,1E+00	2,1E+00	1,0E+02	5,0E+01
NFAT5	8,0E-10	7,3E-09	2,1E+00	2,1E+00	5,8E+02	2,8E+02
SMC2	8,0E-10	7,3E-09	1,8E+00	1,8E+00	8,3E+02	4,6E+02
UBE2F	8,9E-10	7,9E-09	1,7E+00	1,7E+00	1,4E+03	7,9E+02
EOMES	1,3E-09	1,2E-08	6,0E+00	6,0E+00	3,3E+02	5,5E+01
PPP3CA	1,6E-09	1,4E-08	6,0E-01	-1,7E+00	3,4E+02	5,8E+02
MYC	1,9E-09	1,6E-08	4,7E-01	-2,1E+00	6,6E+02	1,4E+03
MID1IP1	2,2E-09	1,9E-08	1,5E+00	1,5E+00	1,3E+03	8,6E+02
CD80	4,1E-09	3,5E-08	3,0E+00	3,0E+00	3,6E+02	1,2E+02
MX1	7,1E-09	5,9E-08	2,1E+00	2,1E+00	1,1E+03	5,1E+02
RDH10	1,2E-08	9,4E-08	2,1E+00	2,1E+00	4,6E+02	2,1E+02
NCAPH	2,6E-08	2,0E-07	2,7E+00	2,7E+00	4,7E+02	1,7E+02
TNFSF13B	2,8E-08	2,2E-07	2,0E+00	2,0E+00	4,3E+02	2,2E+02
JAG1	4,0E-08	3,1E-07	3,0E+00	3,0E+00	5,6E+01	1,9E+01
CD247	5,2E-08	3,9E-07	1,7E+00	1,7E+00	6,0E+03	3,6E+03

BID	5,3E-08	3,9E-07	5,6E-01	-1,8E+00	1,3E+02	2,3E+02
SGK3	5,6E-08	4,1E-07	5,0E-01	-2,0E+00	7,4E+01	1,5E+02
GZMK	6,6E-08	4,8E-07	3,6E+00	3,6E+00	3,6E+03	1,0E+03
CPT1A	8,0E-08	5,7E-07	5,5E-01	-1,8E+00	2,7E+02	4,9E+02
HLA-DRB1	8,8E-08	6,2E-07	3,9E+00	3,9E+00	1,1E+04	3,0E+03
CALM1	9,3E-08	6,5E-07	5,7E-01	-1,7E+00	9,6E+02	1,7E+03
FAM30A	3,1E-07	2,2E-06	3,6E+00	3,6E+00	6,0E+01	1,7E+01
PECAM1	4,9E-07	3,4E-06	2,8E+00	2,8E+00	1,3E+03	4,7E+02
CXCL10	6,1E-07	4,1E-06	3,4E+00	3,4E+00	3,5E+01	1,0E+01
HAVCR2	7,7E-07	5,1E-06	1,6E+00	1,6E+00	8,3E+02	5,3E+02
AURKA	1,6E-06	1,0E-05	1,8E+00	1,8E+00	1,6E+02	8,7E+01
CTNND1	1,8E-06	1,2E-05	1,7E+00	1,7E+00	7,4E+01	4,3E+01
RPL3	2,5E-06	1,6E-05	6,1E-01	-1,6E+00	3,8E+03	6,3E+03
CCR2	2,7E-06	1,7E-05	3,6E-01	-2,8E+00	7,6E+02	2,1E+03
GZMM	2,9E-06	1,8E-05	6,1E-01	-1,6E+00	3,3E+02	5,4E+02
TIMP1	3,9E-06	2,4E-05	5,7E-01	-1,8E+00	1,0E+03	1,8E+03
GZMB	4,8E-06	2,9E-05	5,7E+00	5,7E+00	3,8E+03	6,6E+02
OAS1	4,9E-06	2,9E-05	1,7E+00	1,7E+00	4,9E+02	2,9E+02
CD7	5,6E-06	3,3E-05	4,9E-01	-2,0E+00	8,0E+02	1,6E+03
IGF1R	5,8E-06	3,4E-05	1,9E+00	1,9E+00	1,1E+02	5,8E+01
IRF5	8,4E-06	4,9E-05	1,9E+00	1,9E+00	2,2E+02	1,2E+02
TRDV2	9,0E-06	5,2E-05	2,8E-01	-3,6E+00	2,8E+01	1,0E+02
IL1A	1,0E-05	5,9E-05	2,7E+00	2,7E+00	2,0E+01	7,5E+00
SELPLG	1,0E-05	5,9E-05	5,6E-01	-1,8E+00	1,9E+02	3,4E+02
KLRB1	1,1E-05	6,2E-05	5,5E-01	-1,8E+00	6,1E+03	1,1E+04
IKBKE	1,2E-05	6,5E-05	1,8E+00	1,8E+00	1,6E+03	9,2E+02
CD38	1,3E-05	7,1E-05	4,8E+00	4,8E+00	1,0E+03	2,1E+02
TNFRSF10 B	1,4E-05	7,5E-05	1,5E+00	1,5E+00	2,1E+02	1,4E+02
PTGDR2	1,7E-05	9,2E-05	4,9E-01	-2,0E+00	1,2E+02	2,5E+02
CXCR5	2,0E-05	1,0E-04	1,8E+00	1,8E+00	4,7E+01	2,6E+01
CCL5	2,1E-05	1,1E-04	5,0E-01	-2,0E+00	1,4E+04	2,8E+04
BATF	2,2E-05	1,1E-04	1,6E+00	1,6E+00	3,5E+02	2,2E+02
IL3	3,5E-05	1,8E-04	2,7E+00	2,7E+00	3,3E+01	1,2E+01
CD8B	3,8E-05	1,9E-04	5,6E-01	-1,8E+00	9,6E+02	1,7E+03
CCL20	4,2E-05	2,1E-04	3,7E-01	-2,7E+00	1,9E+01	5,1E+01
PRKCD	4,6E-05	2,3E-04	1,5E+00	1,5E+00	4,4E+02	3,0E+02
PHGDH	4,9E-05	2,4E-04	1,8E+00	1,8E+00	3,1E+02	1,7E+02
CXCR6	5,1E-05	2,5E-04	4,0E-01	-2,5E+00	8,8E+02	2,2E+03
IRF8	5,9E-05	2,8E-04	2,4E+00	2,4E+00	3,1E+01	1,3E+01
PTGS2	6,1E-05	2,9E-04	2,1E+00	2,1E+00	3,7E+01	1,8E+01
HSD11B1	6,2E-05	2,9E-04	1,7E+00	1,7E+00	4,1E+01	2,4E+01
IRF4	9,0E-05	4,2E-04	1,7E+00	1,7E+00	9,4E+02	5,5E+02
ACTN1	1,0E-04	4,7E-04	1,7E+00	1,7E+00	2,4E+02	1,4E+02
IL1R1	1,5E-04	6,9E-04	4,0E-01	-2,5E+00	6,4E+00	1,6E+01

TCL1A	2,3E-04	1,1E-03	4,9E-01	-2,0E+00	1,4E+01	2,8E+01
MINOS1	2,6E-04	1,2E-03	6,5E-01	-1,5E+00	4,2E+01	6,4E+01
CD40LG	2,7E-04	1,2E-03	5,8E-01	-1,7E+00	7,6E+02	1,3E+03
PROCR	2,7E-04	1,2E-03	4,7E-01	-2,1E+00	3,3E+01	7,2E+01
HDAC7	3,2E-04	1,4E-03	1,7E+00	1,7E+00	6,6E+02	3,9E+02
TNFRSF11A	4,6E-04	2,0E-03	5,7E-01	-1,8E+00	1,6E+02	2,8E+02
CCR5	6,7E-04	2,8E-03	3,9E-01	-2,5E+00	2,8E+02	7,1E+02
CXCL2	7,3E-04	3,0E-03	5,1E-01	-2,0E+00	1,3E+01	2,5E+01
SLC2A1	9,0E-04	3,6E-03	5,7E-01	-1,7E+00	1,5E+02	2,5E+02
IL7R	1,1E-03	4,2E-03	6,2E-01	-1,6E+00	4,4E+03	7,1E+03
CCR4	1,3E-03	5,1E-03	5,8E-01	-1,7E+00	4,6E+03	7,8E+03
IFIT1	1,5E-03	5,7E-03	2,2E+00	2,2E+00	4,7E+01	2,1E+01
IL2	1,7E-03	6,7E-03	2,3E+00	2,3E+00	3,3E+01	1,4E+01
SPIB	1,8E-03	6,8E-03	1,8E+00	1,8E+00	3,2E+01	1,8E+01
IFIT3	2,0E-03	7,6E-03	2,0E+00	2,0E+00	2,9E+01	1,4E+01
FOXP3	2,1E-03	7,9E-03	5,9E-01	-1,7E+00	2,2E+02	3,7E+02
IFI30	2,2E-03	8,3E-03	1,5E+00	1,5E+00	1,2E+02	8,1E+01
IL17F	2,9E-03	1,1E-02	4,4E-01	-2,3E+00	6,2E+00	1,4E+01
NFIL3	2,9E-03	1,1E-02	1,8E+00	1,8E+00	1,4E+03	7,8E+02
NME1	3,1E-03	1,1E-02	1,5E+00	1,5E+00	7,1E+02	4,6E+02
CCL3/L1	3,1E-03	1,1E-02	3,1E+00	3,1E+00	3,2E+02	1,0E+02
TRBV29-1	3,4E-03	1,2E-02	6,1E-01	-1,6E+00	1,7E+03	2,9E+03
IRF7	3,6E-03	1,3E-02	1,6E+00	1,6E+00	2,9E+02	1,8E+02
ENTPD1	4,2E-03	1,4E-02	4,1E+00	4,1E+00	2,1E+03	5,1E+02
IRF6	5,1E-03	1,7E-02	2,4E+00	2,4E+00	4,1E+01	1,7E+01
CXCR4	5,4E-03	1,8E-02	2,2E+00	2,2E+00	3,1E+03	1,4E+03
LILRB3	5,8E-03	1,9E-02	6,6E-01	-1,5E+00	2,9E+01	4,4E+01
TRAV7	5,8E-03	1,9E-02	6,3E-01	-1,6E+00	1,9E+01	3,0E+01
MS4A1	6,1E-03	2,0E-02	6,6E-01	-1,5E+00	2,3E+01	3,5E+01
IL7	7,0E-03	2,2E-02	5,7E-01	-1,8E+00	2,0E+01	3,4E+01
SIGLEC5	8,5E-03	2,6E-02	5,9E-01	-1,7E+00	1,5E+01	2,6E+01
DUSP1	9,1E-03	2,8E-02	4,9E-01	-2,0E+00	3,5E+02	7,1E+02
CCL19	9,6E-03	2,9E-02	6,5E-01	-1,5E+00	1,9E+01	3,0E+01
CPT1B	9,9E-03	3,0E-02	1,7E+00	1,7E+00	9,2E+01	5,5E+01
TOX	1,1E-02	3,2E-02	1,5E+00	1,5E+00	4,8E+02	3,2E+02
CMKLR1	1,2E-02	3,4E-02	4,1E-01	-2,4E+00	6,5E+00	1,6E+01
TBX21	1,3E-02	3,7E-02	6,2E-01	-1,6E+00	5,7E+02	9,1E+02
MT2A	1,3E-02	3,7E-02	2,0E+00	2,0E+00	9,8E+02	5,0E+02
CCL25	1,7E-02	4,9E-02	1,6E+00	1,6E+00	2,6E+01	1,6E+01
PRF1	1,8E-02	4,9E-02	6,3E-01	-1,6E+00	3,6E+03	5,7E+03
MAML3	1,8E-02	4,9E-02	1,6E+00	1,6E+00	1,1E+02	7,2E+01

Supplementary Table S3. List of genes used as input for TFacts analysis

Genes significantly upregulated in CAR[B]-T compared to CAR[E]-T and Mock-T			Genes significantly downregulated in CAR[B]-T compared to CAR[E]-T and Mock-T
ACTN1	HSD11B1	NSD2	RORC
ACVR1B	ICAM1	OAS1	CCR6
AURKA	ICOSLG	OAS3	TRDV2
BATF	IFI30	PECAM1	MAF
BATF3	IFI6	PHGDH	CCR2
BCL2L1	IFIT1	PIK3R3	CCL20
BUB1	IFIT3	PRKCD	CCR5
CASP3	IFNGR2	PTGER4	IL1R1
CCL1	IGF1R	PTGS2	CXCR6
CCL22	IKBKE	RDH10	CMKLR1
CCL25	IKZF2	SGO2	IL17F
CCL3/L1	IKZF4	SHMT2	VSIR
CCR8	IL13	SMC2	PROCR
CD200	IL15	SPIB	MYC
CD247	IL1A	SRC	CD7
CD276	IL2	STAT1	PTGDR2
CD38	IL21	TCF7	TCL1A
CD40	IL3	TFRC	DUSP1
CD80	IL36A	TNFRSF10B	SGK3
CD84	IL6ST	TNFRSF18	CCL5
CD9	IRF4	TNFRSF4	CXCL2
CEACAM1	IRF5	TNFRSF9	RORA
CIITA	IRF6	TNFSF13B	CPT1A
CPT1B	IRF7	TOX	KLRB1
CRLF2	IRF8	UBE2F	BID
CSF2	JAG1	USP18	SELPLG
CSF2RA	LIF	XAF1	CD8B
CTNND1	LTA	XCL1/2	TIMP1
CXCL10	MAML3		IL7
CXCL13	MID1IP1		TNFRSF11A
CXCR4	MKI67		CALM1
CXCR5	MMP9		SLC2A1
EBI3	MT2A		TGFB1
ENTPD1	MTHFD2		CCR4
EOMES	MX1		CD40LG
FAM30A	NCAPG2		FOXP3
Feature ID	NCAPH		SIGLEC5
GZMB	NEK2		PPP3CA
GZMK	NFAT5		GZMM
HAVCR2	NFIL3		RPL3
HDAC7	NFKB2		PRKCB
HIF1A	NFKBIA		TRBV29-1
HLA-DRA	NME1		IL7R
HLA-DRB1	NOD2		TBX21
HMGCR	NR3C1		TRAV7
			PRF1
			CASP8
			CCL19
			MINOS1
			RPL23
			MS4A1
			LILRB3

Supplementary Table S4. Melting temperature of the selected scFvs

ScFvs	T _m (°C)
scFv[A]	62
scFv[B]	55
scFv[C]	67
scFv[D]	66
scFv[E]	69

Supplementary Table S5. Statistical analysis

Statistical test													
Figure	Constructs	T cells from n healthy donors	Mean	SD	SEM	95% confidence interval of the mean	Median	Statistical test	Multiple comparison correction	p value			
1E	CAR[A]	5	7.57	4.175	1.867	2.39-12.75	6.129	One-way ANOVA	Dunnnett	CAR[A] vs Mock 0.0001			
	CAR[B]	5	30.8	19.57	8.752	6.5-55.1	30.83			CAR[B] vs Mock 0.0001			
	CAR[C]	5	5.562	3.898	1.743	0.72-10.4	4.099			CAR[C] vs Mock 0.0001			
	CAR[D]	5	2.254	1.839	0.8223	0.03-4.5	1.417			CAR[D] vs Mock 0.0001			
	CAR[E]	5	2.038	1.152	0.5151	0.61-3.47	1.668			CAR[E] vs Mock 0.0001			
1F	Mock	5	118.5	20.35	9.1	93.27-143.8	109.1	One-way ANOVA	Dunnnett	CAR[A] vs Mock 0.37			
	CAR[A]	5	50.75	37.68	16.85	3.968-97.54	74.54			CAR[B] vs Mock 0.99			
	CAR[B]	5	72.03	51.69	23.11	7.859-136.2	92.53			CAR[C] vs Mock 0.009			
	CAR[C]	5	18.33	17.77	7.945	-3.73 -40.39	14.7			CAR[D] vs Mock 0.001			
	CAR[D]	5	3.308	1.822	0.815	1.046-5.57	3.632			CAR[E] vs Mock 0.001			
Figure	CAR[E]	5	3.574	3.682	1.647	-0.9984-8.15	2.534	One-way ANOVA	Dunnnett	CAR[E] vs Mock 0.001			
	Mock	5	79.18	14.82	6.63	60.77-97.58	79.55						
	Constructs	T cells from n healthy donors	Mean	SD	SEM	95% confidence interval of the mean	Median			Statistical test	Multiple comparison correction	p value	
	CAR[E]	4	2054	93.19	46.59	1905-2202	2068			Unpaired t-test	-	CAR[E] vs Mock <0.0001	
	Mock	4	-14.29	44.09	22.05	-84.45-55.86	-33.51					U3060	
1M	CAR[E]	4	725.4	73.27	36.64	608.8-842	717.1	Unpaired t-test	-	CAR[E] vs Mock 0.0001			
	Mock	4	29.03	142.4	71.22	-197.6-255.7	-40.4					U3086	
	CAR[E]	4	109.9	26.99	13.5	66.99-152.9	108.3			Unpaired t-test	-	CAR[E] vs Mock 0.0028	
	Mock	4	-16.18	44.3	22.15	-86.68-54.32	-37.51						U3042
	CAR[E]	4	25.43	8.77	4.39	11.47-39.39	25.77					Unpaired t-test	-
1N	Mock	4	100	16.48	8.24	73.78-126.2	95.21	Unpaired t-test	-	CAR[E] vs Mock 0.0154			
	CAR[E]	4	58.77	13.36	6.68	37.51-80.03	60.89				U3086		
	Mock	4	100	20.69	10.34	67.08-132.9	96.25						
	CAR[E]	4	82.49	26.65	13.33	40.08-124.9	84.12			Unpaired t-test	-	CAR[E] vs Mock 0.30	
	Mock	4	100	16.28	8.14	74.09-125.9	100.3						U3042
Figure	Constructs	n number of mice	Median survival	Statistical test	p value								
1Q	CAR[E]	10	48	Log-rank	CAR[E] vs Mock 0.0015								
	Mock	9	33	(Mantel-Cox)									

Supplementary Table S5. Statistical analysis

Figure	Constructs	T cells from n healthy donors	Mean	SD	SEM	95% confidence interval of the	Median	Statistical test			
								Statistical test	Multiple comparison	p value	
3B	CAR[B]	6	96188	3563	1455	92449-99927	96168	One-way ANOVA	Tukey	CAR[B] vs CAR[E] 0.002	
	CAR[E]	6	85467	6597	2693	78543-92390	84279			CAR[B] vs Mock <0.0001	
	Mock	6	70714	1382	564.1	69264-72164	70459			CAR[E] vs Mock <0.0001	
3C	CAR[B]	6	2978	1757	717.1	1134-4821	2653	One-way ANOVA	Tukey	CAR[B] vs CAR[E] 0.0006	
	CAR[E]	6	155.7	118.8	48.5	31.04-280.4	106.9			CAR[B] vs Mock 0.0004	
	Mock	6	2,557	5,894	2,406	-3,63-8,74	0			CAR[E] vs Mock 0.96	
3D	CAR[B]	3	26.67	7.123	4.113	8.97-44.36	29.9	One-way ANOVA	Tukey	CAR[B] vs CAR[E] 0.0067	
	CAR[E]	3	9.153	2.706	1.562	2.43-15.87	9.91			CAR[B] vs Mock 0.0089	
	Mock	3	10.14	0.5411	0.3124	8.8-11.48	10.1			CAR[E] vs Mock 0.96	
3E	CAR[B]	3	9.127	2.725	1.573	2.36-15.9	10.7	One-way ANOVA	Tukey	CAR[B] vs CAR[E] 0.0067	
	CAR[E]	3	1.96	1.467	0.8472	-1.69-5.61	2.22			CAR[B] vs Mock 0.0076	
	Mock	3	2.13	0.4349	0.2511	1.05-3.21	2.34			CAR[E] vs Mock 0.99	
3F	CAR[B]	3	41.9	16.62	9.593	0.63-83.17	43.6	One-way ANOVA	Tukey	CAR[B] vs CAR[E] 0.04	
	CAR[E]	3	15.03	3.062	1.768	7.43-22.64	13.9			CAR[B] vs Mock 0.15	
	Mock	3	23.53	5.928	3.423	8.81-38.26	24.2			CAR[E] vs Mock 0.6	
3G	CAR[B]	3	13.2	2.128	1.229	7.91-18.49	13.6	One-way ANOVA	Tukey	CAR[B] vs CAR[E] 0.0013	
	CAR[E]	3	3.247	1.213	0.7005	0.23-6.26	3.71			CAR[B] vs Mock 0.002	
	Mock	2	2.96	0.5657	0.4	-2.12-8.04	2.96			CAR[E] vs Mock 0.98	
Figure 3I	Constructs	Number of T cells n	Mean	SD	SEM	95% confidence interval of the	Median	Statistical test	Multiple comparison	p value	T cells from n healthy donors
	CAR[B]	30	8,737	8.18	1.469	5,74-11,74	5,52	Unpaired t-test	-	CAR[B] vs CAR[E] <0.0001	
CAR[E]	27	20.3	12.6	2.382	15.42-25.19	18.26					
Figure 3K	Constructs	T cells from n healthy donors	Mean	SD	SEM	95% confidence interval of the	Median	Statistical test	Multiple comparison	p value	
	CAR[B]	3	29.63	6,334	3,657	13,9-45,37	31.8	One-way ANOVA	Tukey	CAR[B] vs CAR[E] 0.0044	
	CAR[E]	3	10.37	3,423	1,976	1,87-18,88	9.65			CAR[B] vs Mock 0.0024	
Mock	3	7.92	2,756	1,591	1,03-14,77	9.17	CAR[E] vs Mock 0.79				
Figure 3L	CAR[B]	3	104.5	29.91	17.27	30.24-178.8	112	One-way ANOVA	Tukey	CAR[B] vs CAR[E] 0.0027	
	CAR[E]	3	21.47	0.7095	0.4096	19.7-23.23	21.6			CAR[B] vs Mock 0.0012	
	Mock	3	7.49	4,489	2,592	-3,66-18,64	7.01			CAR[E] vs Mock 0.61	

Supplementary Table S5. Statistical analysis

								Statistical test		
Figure	Constructs	T cells from n healthy donors	Mean	SD	SEM	95% confidence interval of the mean	Median	Statistical test	Multiple comparison	p value
4C	CAR[B]	4	35.43	12.39	6.196	15.71-55.15	35.6	One-way ANOVA	Dunnett	CAR[B] vs [B]-H1 0.54 CAR[B] vs [B]-H2 0.086 CAR[B] vs [B]-H3 0.99 CAR[B] vs [B]-L3 0.035 CAR[B] vs [B]-All 0.0001 CAR[B] vs CAR[E] 0.0001
	[B]-H1	4	44.69	5.125	2.562	36.54-52.85	45.99			
	[B]-H2	4	51.89	11.65	5.827	33.35-70.43	48.69			
	[B]-H3	4	37.84	6.543	3.271	27.43-48.25	35.5			
	[B]-L3	4	54.7	11.58	5.792	36.27-73.14	52.27			
	[B]-All	4	81.93	10.08	5.042	65.89-97.98	84.22			
4D	CAR[E]	4	97.2	1.313	0.6564	95.11-99.29	97.79	One-way ANOVA	Dunnett	CAR[B] vs [B]-H2L3wt 0.0001 CAR[B] vs CAR[E] 0.0001
	CAR[B]	3	37.69	8.403	4.852	16.81-58.56	33.11			
	[B]-H2L3wt	3	87.78	2.514	1.451	81.53-94.02	88.62			
4F	CAR[E]	3	97.96	1.274	0.7353	94.79-101.1	98.32	One-way ANOVA	Dunnett	CAR[B] vs [B]-H2 0.0002 CAR[B] vs [B]-L3 0.0001 CAR[B] vs [B]-H2L3wt 0.0001 CAR[B] vs CAR[E] 0.0001
	CAR[B]	4	11.51	10.73	2.065	7.27-15.76	7.319			
	[B]-H2	4	30.47	18.74	2.927	24.56-36.39	25.62			
	[B]-L3	4	30.81	19.11	2.984	24.78-36.84	24.29			
	[B]-H2L3wt	4	40.57	19.43	2.929	34.67-46.48	42.28			
	CAR[E]	4	30.34	18.91	2.55	25.23-35.45	28.72			
4G	CAR[B]	4	589500	29411	14705	542701-636299	590000	One-way ANOVA	Dunnett	CAR[B] vs [B]-H2 0.62 CAR[B] vs [B]-L3 0.20 CAR[B] vs [B]-H2L3wt 0.0064 CAR[B] vs CAR[E] 0.0001 CAR[B] vs Mock 0.0001
	[B]-H2	4	567500	15716	7858	542492-592508	568000			
	[B]-L3	4	553250	23641	11821	515631-590869	554000			
	[B]-H2L3wt	4	522750	31405	15702	472778-572722	536500			
	CAR[E]	4	484750	28964	14482	438662-530838	483000			
	Mock	4	446500	18339	9170	417318-475682	445000			
4H	CAR[B]	4	100.7	45.63	22.82	28.05-173.3	100.4	One-way ANOVA	Dunnett	CAR[B] vs [B]-H2 0.0019 CAR[B] vs [B]-L3 0.0009 CAR[B] vs [B]-H2L3wt 0.0001 CAR[B] vs CAR[E] 0.0001 CAR[B] vs Mock 0.0001
	[B]-H2	4	35.47	17.2	8.601	8.101-62.85	34.29			
	[B]-L3	4	30.37	12.19	6.093	10.98-49.76	32.52			
	[B]-H2L3wt	4	12.66	5.012	2.506	4.681-20.63	14.79			
	CAR[E]	4	14.7	14.19	7.094	-7.873-37.28	9.912			
	Mock	4	1.037	0.6859	0.3429	-0.05402-2.13	1.007			
4J	CAR[B]	6	97365	4316	1762	92836-101894	97176	One-way ANOVA	Dunnett	CAR[B] vs CAR[B]d 0.0001 CAR[B] vs CAR[E] 0.0001 CAR[B] vs CAR[E]d 0.0001 CAR[B] vs Mock 0.0001
	CAR[B]d	6	78202	3768	1538	74247-82156	77745			
	CAR[E]	6	77009	6274	2561	70425-83594	76688			
	CAR[E]d	6	75054	7764	3170	66906-83203	75468			
	Mock	6	78597	3317	1354	75116-82078	78014			
4K	CAR[B]	6	2264	1259	514	942.7-3585	2018	One-way ANOVA	Dunnett	CAR[B] vs CAR[B]d 0.0001 CAR[B] vs CAR[E] 0.0001 CAR[B] vs CAR[E]d 0.0001 CAR[B] vs Mock 0.0001
	CAR[B]d	6	17.15	31.4	12.82	-15.8-50.11	3.181			
	CAR[E]	6	474.2	179.7	73.37	285.6-662.8	508.1			
	CAR[E]d	6	24.46	33.9	13.84	-11.12-60.04	5.625			
	Mock	6	8.449	10.08	4.115	-2.13-19.03	4.934			
4M	CAR[B]	4	19.63	3.93	1.965	13.37-25.88	19.65	One-way ANOVA	Dunnett	CAR[B] vs CAR[B]d 0.0002 CAR[B] vs CAR[E] 0.0001 CAR[B] vs CAR[E]d 0.0001 CAR[B] vs Mock 0.0003
	CAR[B]d	6	11.04	2.283	0.932	8.64-13.43	10.06			
	CAR[E]	6	10.18	2.324	0.9488	7.74-12.62	9.39			
	CAR[E]d	6	9.998	3.289	1.343	6.55-13.45	10.8			
	Mock	6	11.12	1.718	0.7014	9.31-12.92	10.4			
4N	CAR[B]	5	35.32	6.101	2.728	27.75-42.89	35.2	One-way ANOVA	Dunnett	CAR[B] vs CAR[B]d 0.0001 CAR[B] vs CAR[E] 0.0001 CAR[B] vs CAR[E]d 0.0001 CAR[B] vs Mock 0.0001
	CAR[B]d	6	13.27	5.163	2.108	7.85-18.69	15.1			
	CAR[E]	6	9.463	5.178	2.114	4.03-14.9	10.9			
	CAR[E]d	6	10.15	5.667	2.314	4.20-16.1	11.3			
	Mock	6	12.05	3.074	1.375	8.24-15.87	11.8			
4O	CAR[B]	5	34.8	9.753	4.362	22.69-46.91	32.2	One-way ANOVA	Dunnett	CAR[B] vs CAR[B]d 0.0001 CAR[B] vs CAR[E] 0.0001 CAR[B] vs CAR[E]d 0.0001 CAR[B] vs Mock 0.0001
	CAR[B]d	6	16.52	3.511	1.434	12.83-20.2	17.3			
	CAR[E]	6	13.9	4.184	1.708	9.51-20.2	14.7			
	CAR[E]d	6	14.79	5.215	2.129	9.32-20.27	14.2			
	Mock	5	14.7	2.286	1.022	11.86-17.54	13.5			
4P	CAR[B]	4	25.38	3.453	1.726	19.88-30.87	24	One-way ANOVA	Dunnett	CAR[B] vs CAR[B]d 0.0001 CAR[B] vs CAR[E] 0.0002 CAR[B] vs CAR[E]d 0.001 CAR[B] vs Mock 0.0002
	CAR[B]d	6	6.54	3.038	1.24	3.35-9.3	6.955			
	CAR[E]	6	9.27	4.435	1.811	4.62-13.92	9.94			
	CAR[E]d	6	11.23	8.328	3.4	2.49-19.97	10.81			
	Mock	6	9.082	3.802	1.552	5.09-13.07	8.27			
4Q	CAR[B]	5	77.9	7.342	3.283	68.78-87.02	76.9	One-way ANOVA	Dunnett	CAR[B] vs CAR[B]d 0.0001 CAR[B] vs CAR[E] 0.0007 CAR[B] vs CAR[E]d 0.0002 CAR[B] vs Mock 0.0001
	CAR[B]d	6	35.55	13.09	5.345	21.81-49.29	40.25			
	CAR[E]	6	43.75	11.16	4.556	32.04-55.46	44.8			
	CAR[E]d	6	40.43	16.78	6.85	22.82-58.04	44.05			
	Mock	6	35.75	12.66	5.167	22.47-49.03	37			

Supplementary Table S5. Statistical analysis

Figure	Constructs	T cells from n	Cell line	Mean	SD	SEM	95% confidence interval of the mean	Median	Statistical test		
									Statistical test	Multiple comparison	p value
S1C	Mock	3		-50.07	9.538	5.507	-73.76 -26.37	-45.05	Unpaired t-test	-	CAR[E] vs Mock 0.0002
	CAR[E]	4	U-87MG	2261	408.4	204.2	1611-2911	2360	Unpaired t-test		
	Mock	4		-52.21	11.22	5.611	-70.07-34.35	-55.97	Unpaired t-test	-	CAR[E] vs Mock 0.30
	CAR[E]	4	MeI526	2.868	96.84	48.42	-151.2-157	-44.08	Unpaired t-test		
	Mock	4		-61.91	5.277	2.638	-70.31-53.52	-62.76	Unpaired t-test	-	CAR[E] vs Mock <0.0001
	CAR[E]	4	U3101	2259	281	140.5	1812-2706	2332	Unpaired t-test		
	Mock	4		-27.82	18.6	9.301	-57.43-1.777	-29.04	Unpaired t-test	-	CAR[E] vs Mock <0.0001
	CAR[E]	4	U3024	2449	151.1	75.55	2209-2690	2453	Unpaired t-test		
	Mock	4		-12.96	26.87	13.43	-55.72-29.8	-25.07	Unpaired t-test	-	CAR[E] vs Mock <0.0001
	CAR[E]	4	U3021	2114	122.7	61.35	1919-2309	2132	Unpaired t-test		
S1D	Mock	4		-16.96	7.836	3.918	-29.43-4.49	-16.85	Unpaired t-test	-	CAR[E] vs Mock 0.004
	CAR[E]	4	U3082	135.5	67.11	33.55	28.71-242.3	106.1	Unpaired t-test		
	Mock	4		-58.76	8.809	4.405	-72.78 -44.74	-60.58	Unpaired t-test	-	CAR[E] vs Mock <0.0001
	CAR[E]	4	U3053	333.1	79.23	39.61	207-459.1	330	Unpaired t-test		
	Mock	3		99.97	30.33	17.51	24.63-175.3	91.37	Unpaired t-test	-	CAR[E] vs Mock 0.0027
	CAR[E]	4	U-87MG	10.66	11.58	5.791	-7.771-29.09	6.557	Unpaired t-test		
	Mock	4		100	7.776	3.888	87.63-112.4	100.7	Unpaired t-test	-	CAR[E] vs Mock 0.07
	CAR[E]	4	MeI526	65.7	30.63	15.32	16.96-114.4	67.47	Unpaired t-test		
	Mock	3		130.1	72.07	41.61	-48.89-309.2	170.5	Unpaired t-test	-	CAR[E] vs Mock 0.015
	CAR[E]	4	U3101	4.465	1.742	0.8709	1.69-7.24	4.154	Unpaired t-test		
S1D	Mock	4		60.49	30.24	3.78-196.3	99.88	99.88	Unpaired t-test	-	CAR[E] vs Mock 0.022
	CAR[E]	4	U3024	6.7	1.375	0.6874	4.51-8.89	7.143	Unpaired t-test		
	Mock	4		93.91	13.19	6.596	72.92-114.9	96.78	Unpaired t-test	-	CAR[E] vs Mock <0.0001
	CAR[E]	4	U3021	10.7	4.541	2.27	3.476-17.93	8.777	Unpaired t-test		
	Mock	4		100	18.9	9.45	69.93-130.1	103.1	Unpaired t-test	-	CAR[E] vs Mock 0.008
	CAR[E]	4	U3082	51.85	2.496	1.441	45.64-58.05	52.03	Unpaired t-test		
	Mock	4		100	20.85	10.42	66.83-133.2	98.34	Unpaired t-test	-	CAR[E] vs Mock 0.0001
	CAR[E]	4	U3053	5.272	6.415	3.207	-4.935-15.48	2.686	Unpaired t-test		
	Mock	4		100	20.85	10.42	66.83-133.2	98.34	Unpaired t-test	-	CAR[E] vs Mock 0.0001
	CAR[E]	4	U3053	5.272	6.415	3.207	-4.935-15.48	2.686	Unpaired t-test		