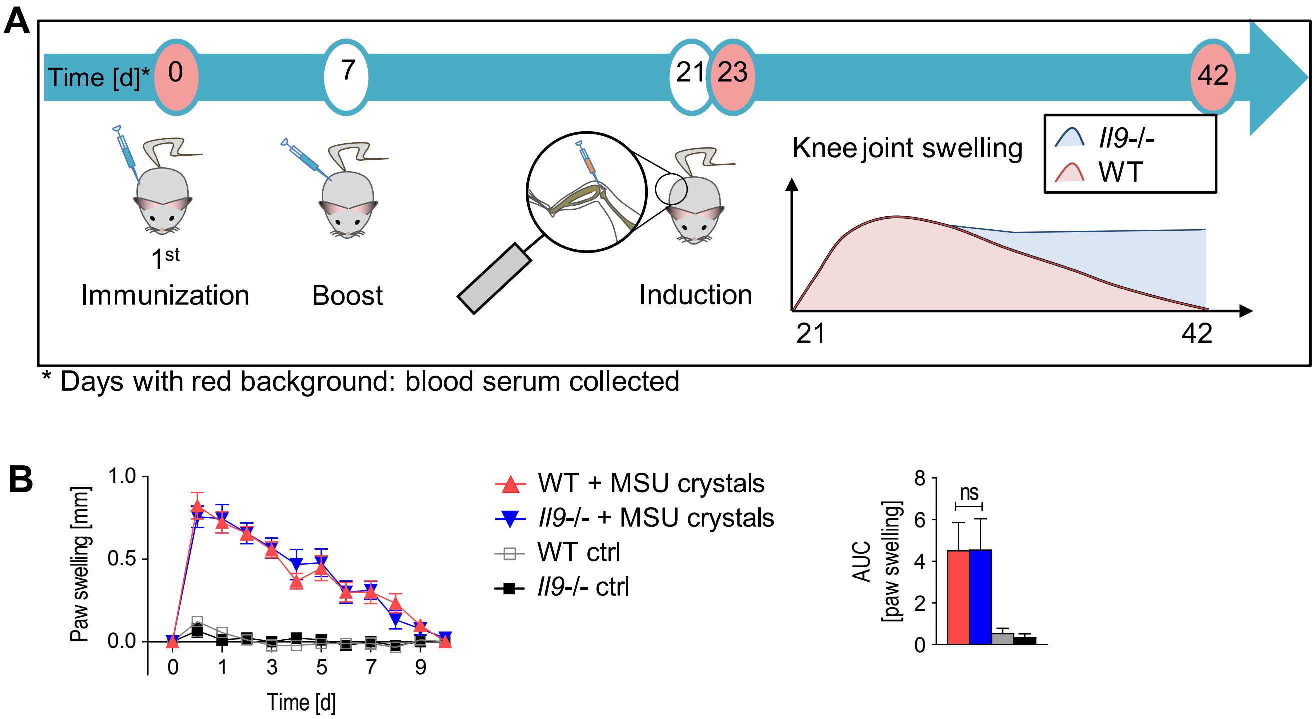
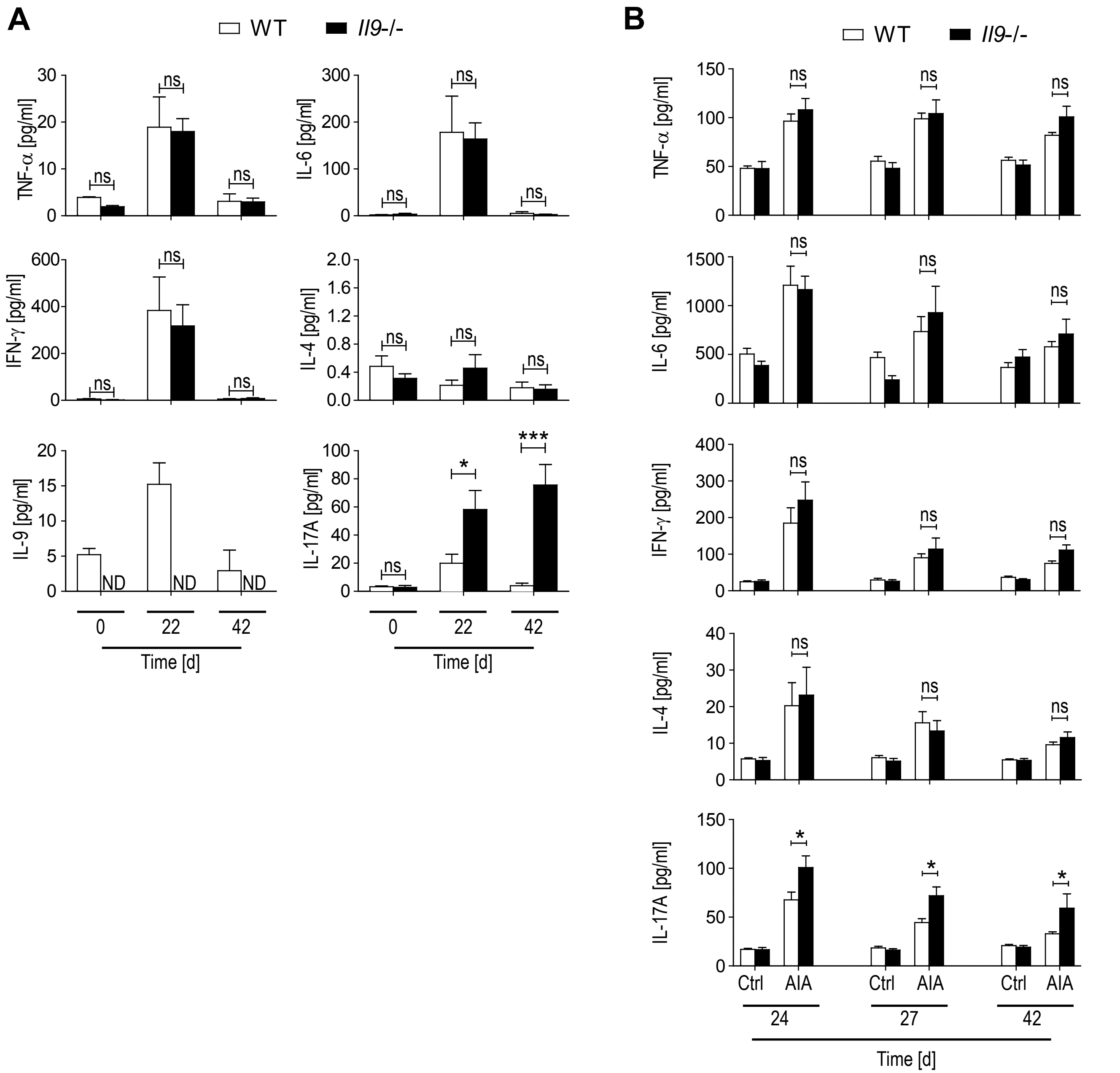


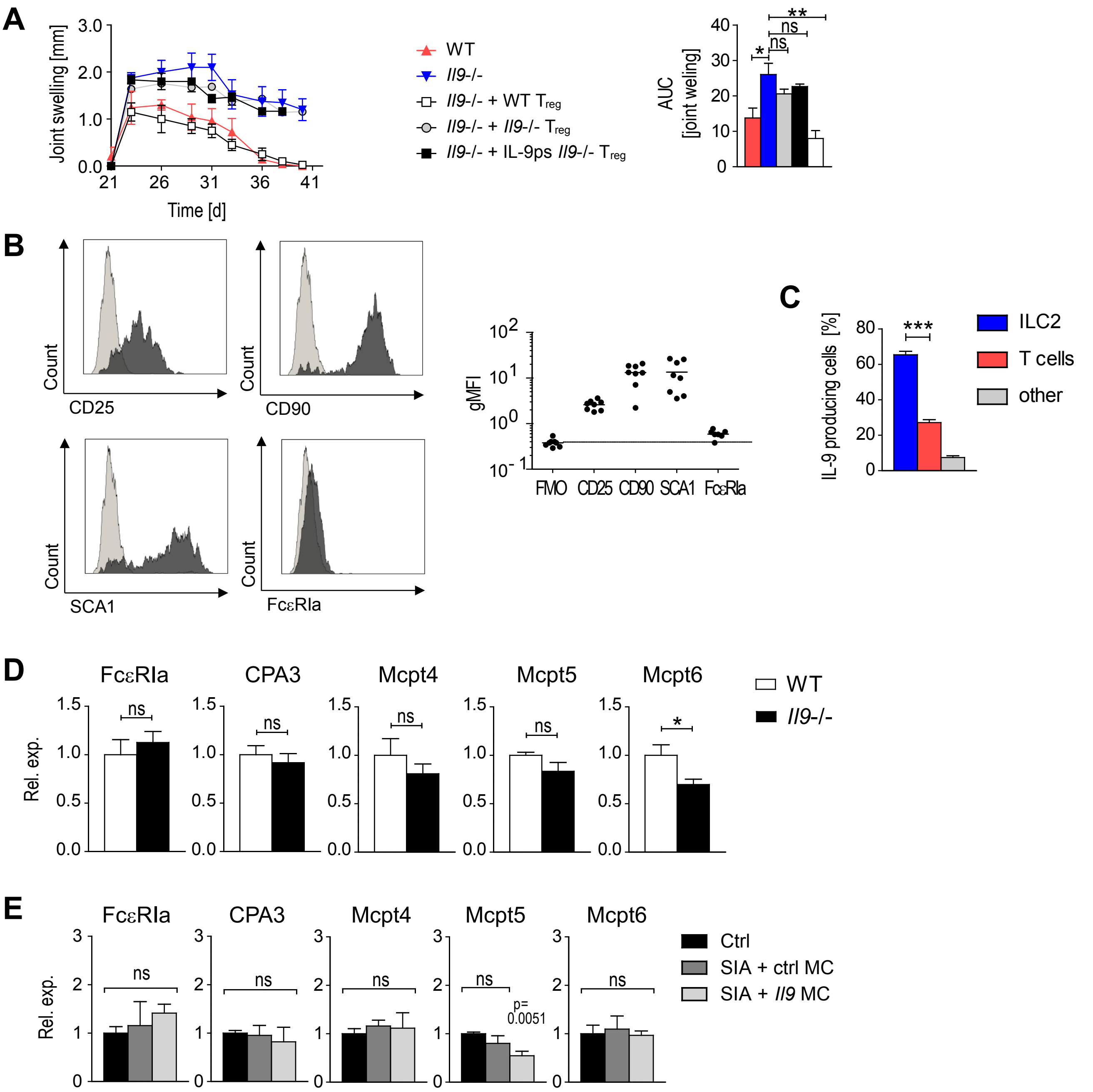
Supplementary Figure 1: Antigen-induced arthritis model and acute inflammation model

(A) Schematic protocol of AIA model.

(B) Monosodium urate (MSU) crystals induced acute arthritis in littermates of WT (n=9) and *Il9*-/- mice (n=9); Y-axis shows paw swelling and the area under the curve (AUC) of paw swelling. Data are shown as the mean ± SEM. ns $p>0.05$ determined by one-way ANOVA with Tukey´s post hoc test.



Supplementary Figure 2: Systemic and local cytokine levels in arthritic wild-type and *Il9* deficient mice
(A) Serum levels of indicated cytokines at day 0, 22 and 42 in AIA WT (n=9) and *Il9*-/- mice (n=9) assessed by bead-based ELISA.
(B) Levels of indicated cytokines in knee joints of AIA WT (n=5) and *Il9*-/- mice (n=5) at day 24, 27 and 42. All data are shown as the mean ± SEM. Asterisks symbol p-value levels: ns p>0.05, * p≤0.05, ***p<0.001 determined by one-way ANOVA with Tukey´s post hoc test.



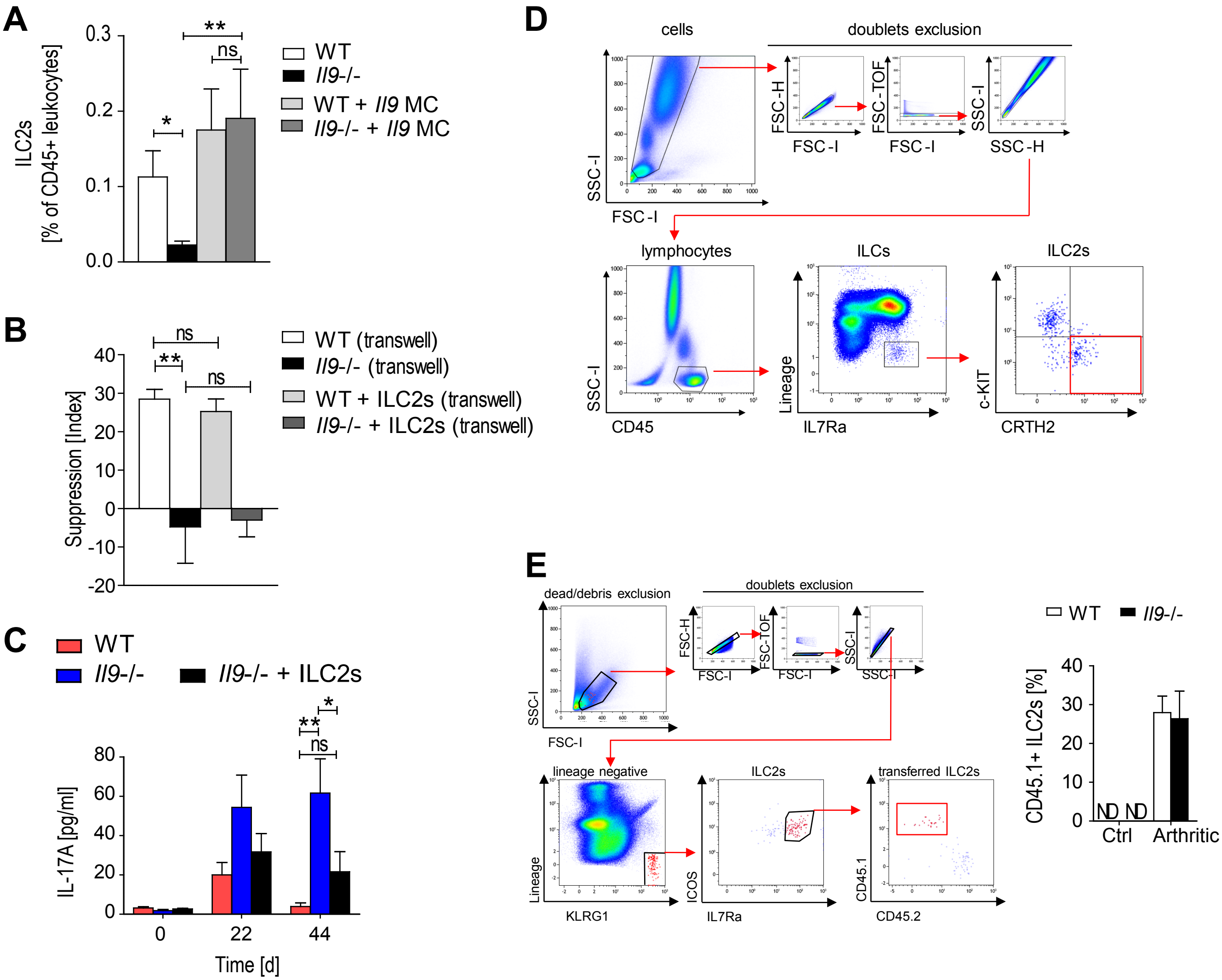
Supplementary Figure 3: T cell and mast cell independent chronification of inflammation

(A) AIA in WT (n=6) and *Il9*-/- mice (n=6); Y-axis shows knee swelling relative to control and the area under the curve (AUC) of knee swelling. As indicated, sorted Tregs from *Il9*-/- mice were pre-stimulated (ps) with recombinant IL-9 for 72h before adoptive transfer into *Il9*-/- mice (n=6). Transfer of WT Tregs into *Il9*-/- mice (n=6) served as control.

(B) Cytometric co-staining of citrine positive cells isolated from inflamed joints of *Il9*-Citrine reporter mice (n=8) at day 27. Representative histograms of fluorescence-minus controls (FMO; light grey) and the respective markers CD25, CD90, Sca-1 and FcεRIa (dark grey) are shown; respective geometric mean fluorescence intensity (gMFI) of 8 independent experiments.

(C) Quantitative analysis of IL-9 positive cells in the affected knee joints from WT mice upon induction of AIA (n=6) with immunofluorescence staining for CD3ε, DAPI, ICOS, IL-9. CD3+/IL-9+ (T cells), ICOS+/IL-9+/CD3- (ILC2s) and IL-9+/CD3-/ICOS- (others) cells were counted per 0.3 mm² of synovial tissue.

(D, E) mRNA expression levels of mast cell associated genes in inflamed joints of (D) AIA and (E) SIA of 4-6 mice of each group; expression levels were normalized to *B2m*. All data are shown as the mean ± SEM. Asterisks symbol p-value levels: ns p>0.05, * p≤0.05, ** p≤0.01, ***p<0.001 determined by one-way ANOVA with Tukey´s post hoc test (A, C, E) or Student´s t test (D).



Supplementary Figure 4: ILC2/Treg interactions in the resolution of inflammation

(A) Induction of ILC2s by hydrodynamic gene therapy with IL-25 and IL-33 in WT and *Il9-/-* mice with and without supplementation of IL-9. Data are shown as the mean ± SEM of 3-6 independent experiments of each group.

(B) Suppressive capacity of CD4posFoxP3pos Tregs from WT and *Il9-/-* mice co-cultured w/o ILC2s in a transwell system. Cell proliferation of CD4+FoxP3- responder cells (Teff) was assessed by the dilution of the fluorescent dye CFSE to dividing daughter cells. Suppression was calculated using the division index.

(C) Serum levels of IL-17 at day 0, 22 and 44 in AIA WT and *Il9-/-* mice w/o adoptive transfer of ILC2s. Data are shown as the mean ± SEM of at least 6 mice of each group.

(D) Cytometric gating strategy to identify human ILC2s. Representative dotplots are shown.

(E) Survival and persistence of ILC2s within the knee joint of WT and *Il9-/-* mice with AIA upon intra-articular injection (CD45.2; n=4 respectively). ILC2s were sorted from CD45.1 mice and injected intra-articularly together with mBSA at day 21. Cytometric single-cell analysis of digested synovial tissue was performed at day 27 of AIA. Representative dot plots are included. All data are shown as the mean ± SEM. Asterisks symbol p-value levels: ns $p>0.05$, * $p\leq0.05$, ** $p\leq0.01$ determined by one-way ANOVA with Tukey´s post hoc test.

Supplementary Table 1: Antibodies used for flow cytometry of human blood

Target	Clone	Conjugated Dye	Manufacturer	Dilution
CD45	5B1	VioGreen	Miltenyi	1:500
CD127 (IL-7Ra)	A019D5	APC	Biolegend	1:20
CD117 (c-Kit)	104D2	PE/Cy5	eBioscience	1:20
CD294 (CRTH2)	BM16	APC/Cy7	Biolegend	1:20
CD3	UCHT1	FITC	Biolegend	1:50
CD19	HIB19	FITC	Biolegend	1:50
CD14	HCD14	FITC	Biolegend	1:100
CD94	DX22	FITC	Biolegend	1:50
CD34	561	FITC	Biolegend	1:50
CD11c	3.9	Alexa Fluor 488	Biolegend	1:50
FcεRIα	AER-37	FITC	Biolegend	1:50

Supplementary Table 2: Antibodies and dyes used for immunofluorescence imaging

Target	Clone	Conjugate	Manufacturer	Dilution
hCD3	Ps1	-	abcam	1/50
mCD3e	145-2C11	-	Biolegend	1/50
h/mIL-9	Polyclonal ab203386	-	abcam	1/100
h/mICOS	Polyclonal ab111247	-	Abcam	1/100
mFoxP3	FJK-16s	-	eBioscience	1/200
h/mTryptase	AA1	-	Thermo	1/2,000
h/mCD11b	M1/70	-		1/1,00
hCD16	2Q2140	-		1/100
Rabbit	Polyclonal A21244	Alexa 647	invitrogen	1/500
Rabbit	Polyclonal ab150062	Alexa 555	abcam	1/500
Goat	Polyclonal A11058	Alexa 594	invitrogen	1/500
Goat	Polyclonal ab150129	Alexa 488	abcam	1/500
Rat	Polyclonal A21209	Alexa 594	invitrogen	1/500
Rat	Polyclonal A21208	Alexa 488	invitrogen	1/500
Mouse	Polyclonal ab150105	Alexa 488	abcam	1/500
Armenian Hamster	Polyclonal ab173004	Alexa 647	abcam	1/500
Armenian Hamster	Polyclonal ab175680	Alexa 405	abcam	1/500
Nucleus	DAPI	-	Sigma	1/10,000

Supplementary Table 3: Dyes used in flow cytometry and cell sorting

Target	Clone	Conjugated Dye	Manufacturer	Dilution
Viability/DNA	DAPI	-	Sigma	1/10,000
Viability	FVDe780	APC/e780	eBioscience	1/4,000
CD3e	145-2C11	FITC	Biolegend	1/100
CD4	RM4.5	FITC; PE/CY7; APC	Biolegend	1/1,500
CD11b	M1/70	APC	Biolgened	1/1,000
CD11c	N418	PB; APC/CY7	Biolegend	1/200
CD16/CD32 (Fc Block)	93	---	Biolegend	1/100
CD25 (adoptive)	3C7	PE	Biolegend	1/250
CD25 (*in vitro*)	PC61	PE; PE/CY7	Biolegend	1/500
CD44	HM34	PE	Biolegend	1/1,500
CD45	30F11	PE/Dazzel	Biolegend	1/2,000
CD45.1	A20	PE/Dazzel	Biolegend	1/1,000
CD45.2	104	APC/Alexa700	Biolegend	1/1,000
CD45R/B220	RA3-6B2	FITC	Biolegend	1/100
CD49b (pan NK)	DX5	PB; PE/CY7	Biolegend	1/200
CD62L	MEL14	APC/e780	eBioscience	1/1,500
CD90.2	30-H12	PE/CY7	Biolegend	1/1,000
CD127 (IL7Ra)	A7R34	vioFITC	Miltenyi	1/20
CD278 (ICOS)	7E.17G9	PercP/Vio700	Mitenyi	1/50
FcERIa	MAR1	PB; PE/CY7	Biolegend	1/200
FoxP3	FJK-16s	APC	eBioscience	1/200
IFN-γ	XMG21.2	APC	Biolegend	1/200
IL-4	11B11	FITC	Biolegend	1/250
IL-9	RM9A4	PE	Biolegned	1/200
IL-17A	eBio17B7	PE/CY7	Biolegend	1/500
Lineage Cocktail	17A2, RB6-8C5, RA3-6B2, Ter-119, M1/70, +DX5, +N418, +MAR1	PB	Biolegend	1/5
KLRG1	MAFA1	PE; PE/CY7	Biolegend	1/100; 1/300
Ki67	16A8	APC	Biolegend	1/400
Sca-1	D7	PE/CY7	Biolegend	1/1,000
ST2 (IL33R)	RMST2-2	PE	eBioscience	1/100
TCRβ	H57-597	APC	Biolegend	1/1,000

Supplementary Table 4: Primer used for gene expression analysis

Target	Forward Primer	Reverse Primer
B2m	5’-GGTGCTTGTCTCACTGACCG-3’	5’-TTTGAGGGGTTTTCTGGATAGCAT-3’
HPRT1	5’-TCAGTCAACGGGGGACATAAAAG-3’	5’-GGGGCTGTACTGCTTAACCAG-3’
Cpa3	5’-TGGCTACACATTCAAACTGCCT-3’	5’-CCTTGCAACTTTCAATAGGTCCTG-3’
FoxP3	5’-CACCCAGGAAAGACAGCAACCT-3’	5’-CCTTCTCACAACCAGGCCACTT-3’
FcERIa	5’-GTCACTGGAAGGTCTGCCCA-3’	5’-ATGACATCAAGAGACATGAACAGCA-3’
GITR	5’-CAGACTTTGGACCAACTGTTCTCAG-3’	5’-CAGGGAACATGGTGAGAAATCCAA-3’
GITR-L	5’-ACTGCCATCGAGTCCTGCAT-3’	5’-ACTACGAAGGGGGCATTGTCT-3’
ICOS	5’-GAAGCCGTACTTCTGCCGTG-3’	5’-CCGAGCCATTGATTTCTCCTGTT-3’
ICOS-L	5’-AGTCCTTGTCCCCGTCCTTG-3’	5’-GTCAGGCGTGGTCTGTAAGTTC-3’
Mcpt4	5’-TGGGCAGTCCCAGAAAGAAAAG-3’	5’-TCCTCCAGAGTCTCCCTTGTATG-3’
Mcpt5	5’-TCACTGTGCGGGAAGGTCTAT-3’	5’-AGCTTCTGCCACGTGTCTTC-3’
Mcpt6	5’-GACTCCTGCCAGGGCGATTC-3’	5’-CTGCAGCCAGGTACCCTTCA-3’