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Regulatory T Cells

Keeping the Immune System in Check

Antibodies

- pSTAT5 (h, m) New
- CD304 (Neuropilin-1) (h, m) New
- AHR (h, m) New
- c-Maf (h, m) New
- Helios (h, m) New
- ICOS (h, m, r) New
- Eos (m) New
- CD357 (AITR/GITR) (h, m)
- GARP (h, m) New
- LAP (h, m)
- IL-10 (h, m)
- c-Rel (m)

ELISA Kits

- IL-10 ELISA Ready-SET-Go!® (h, m) New

ProcartaPlex™ Multiplex Immunoassays

- IL-10 Simplex (h, m) New
- TGFβ1 Simplex (h, m)
- Th9/Th17/Th22/Treg Cytokine Panels (h, m) New
- Th1/Th2/Th9/Th17/Th22/Treg Chemokine Panels (h, m) New

Recombinant Proteins

- TGFβ1 Recombinant Protein (m) New
- SAFE™ IL-2 Recombinant Protein (h) New

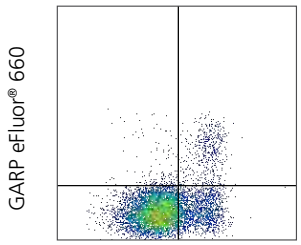
h=human, m=mouse, r=rat

T regulatory (Treg) cells are CD4+ T cells that are critical to the maintenance of immune cell homeostasis as evidenced by the catastrophic consequences of genetic or physical ablation of the Treg population. Specifically, Treg cells maintain order in the immune system by enforcing a dominant negative regulation over other immune cells. Treg cells are characterized by expression of the Foxp3 transcription factor that specifies differentiation of the lineage.

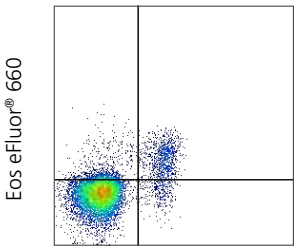
Treg Development

Originally, Treg cells were identified by their expression of the high affinity IL-2 receptor (CD25/CD122), and their ability to suppress the proliferation of conventional T cells. Later, Foxp3 was identified as the lineage-defining transcription factor for this cell population. Foxp3-expressing Treg cells fall into two general categories: tTreg–those that are thymically-derived, also referred to as natural Tregs (nTreg), and pTreg (peripheral Treg) or iTreg (induced Treg)–those that differentiate from conventional CD4+ T cells in the periphery.

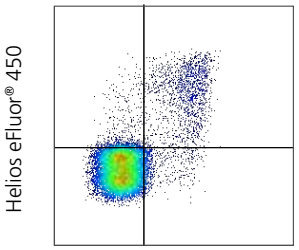
iTreg cells mature in peripheral sites from CD4+ Treg precursors, where they acquire the expression of Foxp3 in addition to markers typical of Tregs, including CD25, CD152 (CTLA4), CD357 (GITR/AITR), Latency Associated Protein (LAP) and GARP. In mouse the two populations can be distinguished by the expression of CD304 (Neuropilin-1) and transcription factor Helios, that are both expressed predominantly on nTreg cells.



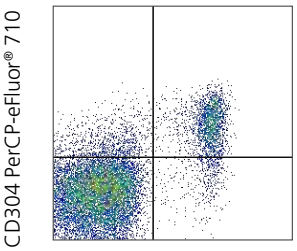
GARP: PBMCs were stimulated with immobilized Anti-Human CD3 Functional Grade (FG) Purified (cat. no. 16-0037), soluble Anti-Human CD28 FG Purified (cat. no. 16-0289) and Human IL-2 Recombinant Protein (cat. no. 14-8029) for 24 hours. Cells were stained with Anti-Human GARP eFluor® 660 and Anti-Human Foxp3 PE (cat. no. 12-4776). Viable lymphocytes, as determined by Fixable Viability Dye eFluor® 450, were used for analysis.



Eos: Intracellular staining of BALB/c splenocytes with Anti-Mouse/Rat Foxp3 eFluor® 450 (cat. no. 48-5773) Anti-Mouse Eos eFluor® 660 using the FoxP3/Transcription Factor Staining Buffer Set (cat. no. 00-5523) and protocol. CD4+ cells in the lymphocyte gate were used for analysis.



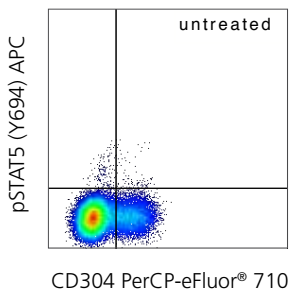
Helios: Intracellular staining of mouse lymph node cells with Anti-Mouse/Rat Foxp3 APC (cat. no. 17-5773) and Anti-Helios eFluor® 450 using the Foxp3/Transcription Factor Buffer Set and protocol (cat. no. 00-5523). CD4+ cells in the lymphocyte gate were used for analysis.

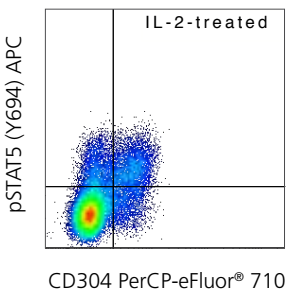


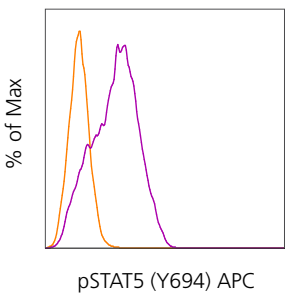
Neuropilin-1 (CD304): Balb/c splenocytes were stained with anti-CD4 PE (cat. no. 12-0042) and with anti-CD304 (cat. no. 46-3041). This was followed by fixation/permeabilization with Foxp3 staining buffer kit, and intranuclear staining with anti-Foxp3 APC (cat. no. 17-5773). CD4+ cells in the lymphogate were used for analysis.

Signals important for Treg formation

In the thymus, high affinity TCR:MHCII-self-peptide interactions act in conjunction with CD28 co-stimulation and IL-2 to promote stable expression of Foxp3 in developing thymocytes. In addition, TGFβ signaling promotes Treg survival during their development. Similar signals have been shown to be necessary for Treg conversion in the periphery. Thus, small doses of high-affinity antigen can drive peripheral Treg differentiation from conventional T cells with weak co-stimulatory interactions. It has been proposed that TCR and CD28 signaling provide the first step of Treg differentiation by inducing responsiveness to cytokine signaling, notably IL-2 signaling and the phosphorylation of STAT5. Interestingly, STAT5 is sufficient to drive the expansion of Tregs in the thymii of mice that express a constitutively active form of STAT5.







phospho-STAT5 (Y694): Untreated (left) or 15-minute Recomb. Hu IL-2-treated (middle) PBMCs stained with Anti-Hu CD304 PerCP-eFluor 710 (cat. no. 46-3041) and Anti-Hu/Mo pSTAT5 (Y694) APC (cat. no. 12-9010) using the IC Fixation/Methanol protocol. Right: Unstimulated (orange histogram) or 15-minute IL-2-treated (purple histogram) PBMCs with Anti-Hu/Mo pSTAT5 APC. CD4+ or CD4+CD304+ regulatory T cells were used for analysis.

Mouse Antibodies																					
						Violet Laser	Blue Laser				Green, Yellow-Green Lasers						Red Laser			
Antigen	Clone	Cat. No.	Purified	Functional Grade	Biotin	eFluor® 450	FITC	Alexa Fluor® 488	PerCP-Cyanine5.5	PerCP-eFluor® 710	PE	PE-eFluor® 610	PE-Cyanine5	PE-Cyanine5.5	PE-Cyanine7	Alexa Fluor® 532	APC	eFluor® 660	Alexa Fluor® 700	APC-eFluor® 780
AHR	4MEJJ	5925						■			■							■		
CD4	GK1.5	0041	■	■	■	■	■	■		■	■		■		■		■	■	■	■
	RM4-5	0042	■	■	■	■	■		■	■	■	■	■	■	■	■	■		■	■
CD25	PC61.5	0251	■	■	■	■		■	■		■		■	■	■		■		■	■
	eBio7D4	0252			■			■										■		
CD39	24DMS1	0391	■	■						■	■				■			■		
CD73	TY/11.8	0731	■	■	■	■				■	■				■					
CD127/IL-7Rα	A7R34	1271	■	■	■	■	■	■	■		■		■		■		■	■	■	■
CD137/4-1BB	17B5	1371	■	■	■	■				■	■						■			
CD152 /CTLA-4	UC10-4B9	1522	■		■						■						■			
CD223/Lag-3	C9B7W	2231	■	■		■				■	■						■			
CD304 (Neuropilin-1)	3DS304M	3041								■										
CD357/GITR/AITR	AITR	5875	■			■		■		■	■						■			
c-Maf	sym0F1	9855								■								■		
c-Rel	1RELAH5	6111									■									
Eos	ESB7C2	5758									■							■		
Foxp3	FJK-16s	5773	■		■	■	■	■	■		■	■	■	■	■	■	■	■	■	
	150D/E4	4774	■					■			■							■		
FR4	eBio12A5	5445			■		■				■				■		■			
GARP	YGIC86	9891				■				■	■				■		■			
Helios	22F6	9883				■	■			■	■						■			
IL-2	JES6-5H4	7021	■	■	■	■	■	■	■		■				■		■			
IL-10	JES5-16E3	7101	■	■	■		■	■	■		■						■		■	
IRF4	3E4	9858	■			■	■			■	■							■		
LAP	TW7-16B4	9821								■	■				■					
pSTAT5	SRBCZX	9010									■									
TIGIT	GIGD7	9501								■	■							■		
Human Antibodies																				
AHR	FF3399	9854	■							■	■							■		
CD4	OKT4	0048	■	■	■	■	■	■	■		■						■	■	■	■
	RPA-T4	0049	■	■	■	■	■		■		■	■	■		■		■		■	■
	SK3	0047				■	■			■	■			■	■	■	■			■
CD25	BC96	0259	■		■	■		■	■		■		■		■		■			■
	CD25-4E3	0257				■				■	■	■			■		■			
CD39	eBioA1	0399	■				■			■	■				■		■			
CD73	AD2	0739				■	■			■	■				■		■			
CD127/IL-7Rα	eBioRDR5	1278	■	■	■	■	■		■		■		■		■		■	■		■
CD137/4-1BB	4B4	1379					■			■	■									
CD152/CTLA-4	14D3	1529	■	■	■					■	■									
CD304 (Neuropilin-1)	TNKUSOHA	3049				■														
CD357/GITR/AITR	DTA-1	5874		■	■	■	■			■	■				■		■			
c-Maf	sym0F1	9855													■			■		
Foxp3	236A/E7	4777	■		■	■	■	■			■				■		■	■		
	PCH101	4776	■		■	■	■	■	■		■	■	■	■	■	■	■	■	■	
GARP	G14D9	9882					■			■	■				■			■		
Helios	22F6	9883				■	■			■	■						■			
IL-2	MQ1-17H12	7029	■			■	■			■	■				■		■			
IL-10	JES3-9D7	7108	■	■		■		■			■							■		
IRF4	3E4	9858	■			■	■			■	■							■		
LAP	FNLAP	9829				■		■		■	■				■					
pSTAT5	SRBCZX	9010									■									
TIGIT	MBSA43	9500		■						■	■						■			

Immunosuppressive effector function

Tregs function through multiple mechanisms, including: secretion of immunosuppressive soluble factors such as IL-9, IL-10, and TGFβ, which may induce cell-cycle arrest or apoptosis in effector T cells; cell contact-mediated regulation via TCR and other molecules such as (CD152) CTLA-4, CD357 (GITR/AITR), which may block the co-stimulation, and maturation of dendritic cells and cytolytic activity.

Proteins and Immunoassays									
Antigen	ProcartaPlex™	ELISPOT Ready-SET-Go!® (RSG)	Platinum ELISA	Instant ELISA®	High Sensitivity ELISA	ELISA Ready-SET-Go!® (RSG)	Single-Use ELISA Ready-SET-Go!® (RSG) Standard	Recombinant Proteins	Recombinant Carrier-Free
Mouse									
IL-2	EPX010-20601		BMS601		BMS601HS	88-7024	39-8021	14-8021	34-8021
IL-10	EPX010-20614	88-7804	BMS614	BMS614INST		88-7105	39-8101	14-8101	34-8101
TGFβ1	EPX010-20608		BMS608/4			88-8350	39-8343	14-8342	34-8342
Human									
CD152/CTLA-4			BMS276						
IL-2	EPX010-10221		BMS221	BMS221INST	BMS221HS	88-7025	39-8029	14-8029	34-8029
IL-10	EPX010-10215	88-7805	BMS215	BMS215INST	BMS215HS	88-7106	39-8109	14-8109	34-8109
LAP			BMS2065			88-50390			
TGFβ1	EPX010-10249		BMS249/4			88-8350	39-8343	14-8348	34-8348
pSTAT5				85-86112					
STAT5 A/B				85-86113					
Rat									
IL-10	EPX010-36049		BMS629						
TGFβ-1	EPX010-30249		BMS623/3						
NHP									
IL-10			BMS642/2	BMS642INST					
TGFβ-1	EPX010-40249								
Canine									
IL-10	EPX010-50502								
TGFβ-1	EPX010-50249								
Porcine									
IL-10	EPX010-66049								
TGFβ-1	EPX010-60249								

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