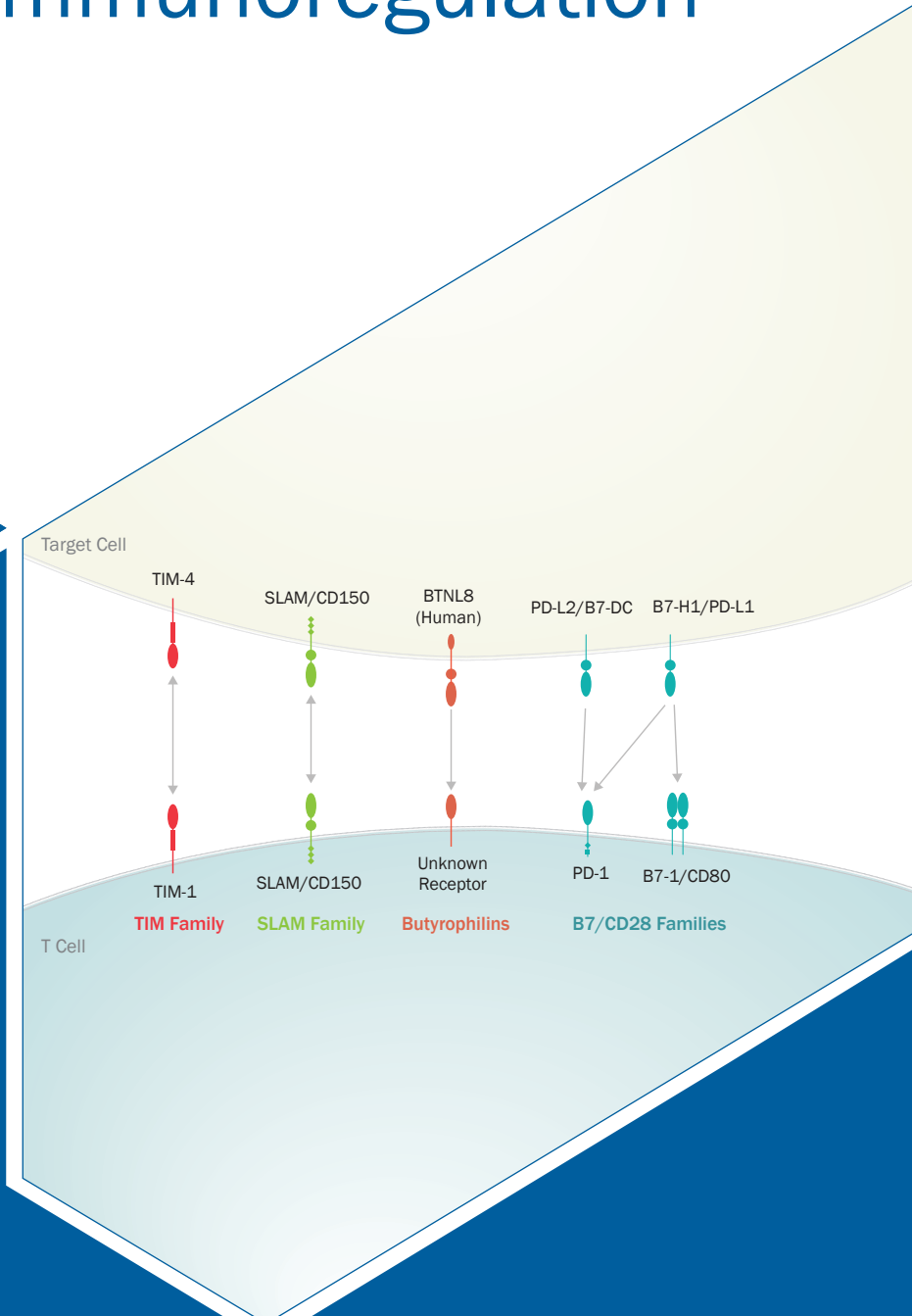


# Tools for Cell Therapy and Immunoregulation



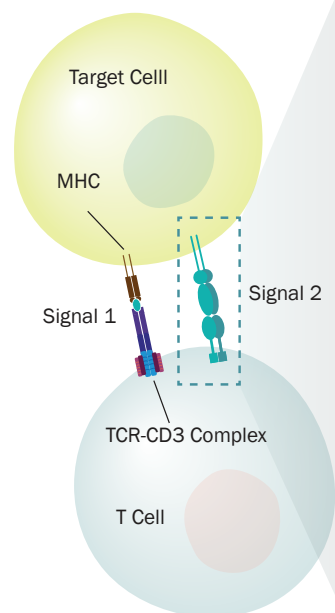
# Multiple Co-Signaling Molecules Regulate T Cell Activation

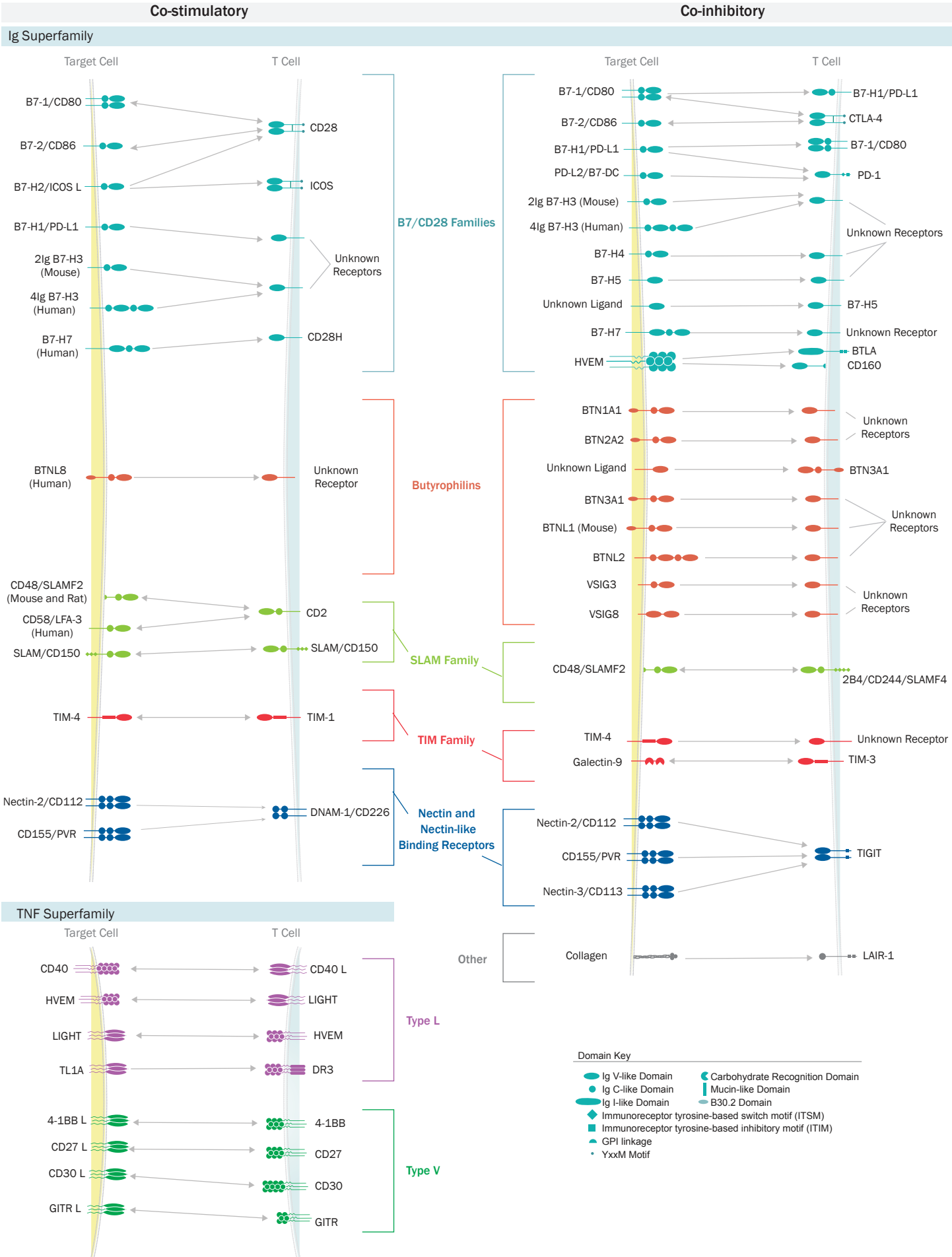
T cell activation requires two signals: 1) recognition of the antigenic peptide/major histocompatibility complex (MHC) by the T cell receptor (TCR) and 2) antigen-independent co-stimulation induced by interactions between co-signaling molecules expressed on target cells, such as antigen-presenting cells (APCs), and their T cell-expressed receptors. Engagement of the TCR in the absence of this second co-stimulatory signal typically results in T cell anergy or apoptosis. In addition, T cell activation can be negatively regulated by co-inhibitory molecules present on APCs. Therefore, integration of the signals transduced by co-stimulatory and co-inhibitory molecules following TCR engagement directs the outcome and magnitude of a T cell response including the enhancement or suppression of T cell proliferation, differentiation, and/or cytokine secretion. Most co-stimulatory and co-inhibitory molecules belong to either the Immunoglobulin (Ig) superfamily or Tumor Necrosis Factor (TNF) receptor superfamily and are further classified as members of the B7/CD28, butyrophilin, CD2/SLAM, TIM, or nectin- and nectin-like binding receptor subfamilies of the Ig superfamily or as members of the type I or type II subfamilies of the TNF receptor superfamily. Many of these proteins are being investigated as potential targets for cancer immunotherapy as multiple studies have shown that the T cell co-stimulatory/co-inhibitory system can be exploited to improve anti-tumor immunity.

B7 proteins are a family of co-signaling molecules that primarily interact with T cell-expressed immune receptors belonging to the CD28 family (CD28, CTLA-4, PD-1, ICOS, and BTLA). The B7 family consists of ten surface glycoproteins including B7-1/CD80, B7-2/CD86, B7-H1/PD-L1, B7-DC/PD-L2, B7-H2/ICOS L, B7-H3, B7-H4, B7-H5/VISTA, B7-H6, and B7-H7/HHLA2. As shown in the graphic on the next page, interactions between B7 and CD28 family members transduce both T cell co-stimulatory and co-inhibitory signals. Additionally, these interactions can have bidirectional effects (indicated by the two-headed arrows).

The butyrophilins are structurally closely related to the B7 family proteins and appear to have similar immunomodulatory functions. To date, thirteen human butyrophilin and butyrophilin-like proteins have been identified including BTN1A1, BTN2A1, BTN2A2, BTN2A3, BTN3A1, BTN3A2, BTN3A3, BTN2L, BTN3L, BTN1L, BTN1L9, BTN1L10, and SKINT-like (SKINTL). With the exception of BTN2L and BTN3A2, butyrophilins are type I transmembrane proteins that contain one IgV-like and one IgC-like domain in their extracellular regions and a cytoplasmic B30.2 domain. Most butyrophilin proteins that have been characterized to date, including human BTN1A1, BTN2A2, BTN3A1, BTN2L, and mouse BTN1L, act through unidentified receptors to inhibit T cell proliferation and cytokine production. The exception is BTN1L8 which enhances T cell proliferation and cytokine secretion. Further investigation is necessary to identify the butyrophilin receptors and determine the functions of the other butyrophilin family members.

Several members of the CD2/signaling lymphocyte activation molecule (SLAM) subfamily, T cell/transmembrane, immunoglobulin, and mucin (TIM) subfamily, and nectin- or nectin-like binding receptor subfamily of the Ig superfamily have also been shown to regulate T cell activation. Like the B7 family, members of these families can have co-stimulatory and/or co-inhibitory effects. In addition, multiple proteins belonging to the TNF receptor superfamily, including 4-1BB/TNFRSF9, CD27/TNFRSF7, CD30/TNFRSF8, CD40/TNFRSF5, DR3/TNFRSF25, GITR/TNFRSF18, HVEM/TNFRSF14, and OX40/TNFRSF4, have been shown to affect T cell co-signaling.





# Products for Studying the Effects of T Cell Co-Signaling Molecules

## Recombinant Proteins

Ig Superfamily				
B7/CD28 Families				
Molecule	Species	Source	Tag	Catalog #
B7-1/CD80	Human	NS0	Fc, His	140-B1
	Human	HEK293	His	9050-B1
	Mouse	NS0	His	740-B1
	Mouse	NS0	His	9014-B1
	<i>Cynomolgus</i>	HEK293	His	9244-B1
B7-2/CD86	Human	NS0	Fc, His	141-B2
	Human	CHO	Fc	7625-B2
	Human	HEK293	His	9090-B2
	Mouse	Sf21 (baculovirus)	Fc	741-B2
B7-H1/PD-L1	Human	NS0	Fc	156-B7
	Human	HEK293	His	9049-B7
	Mouse	NS0	Fc	1019-B7
	Mouse	NS0	His	9048-B7
	B7-H2/ICOS L	Human	NS0	Fc
Human		HEK293	His	8206-B7
Mouse		NS0	Fc	158-B7
Mouse		NS0	His	8127-B7
B7-H3	Human	NS0	His	1027-B3
	Human	NS0	His	1949-B3
	Mouse	NS0	Fc	1397-B3
B7-H3 (4Ig)	Human	NS0	Fc	2318-B3
B7-H4	Human	NS0	His	6576-B7
	Human	HEK293	Fc	8870-B7
	Mouse	NS0	Fc	4206-B7
	Mouse	NS0	His	2154-B7
	B7-H5/VISTA/PD-1H	Human	NS0	Fc
Human		NS0	His	9057-B7
Mouse		NS0	Fc	7005-B7
B7-H6	Human	NS0	Fc	7144-B7
	Human	HEK293	His	9309-B7
	<i>Cynomolgus</i>	HEK293	Fc	8984-B7

Ig Superfamily				
Butyrophilins				
Molecule	Species	Source	Tag	Catalog #
BTN1A1/Butyrophilin	Human	NS0	His	8467-BT
	Mouse	NS0	His	8540-BT
BTN2A1	Human	HEK293	His	9058-BT
BTN2A2/Butyrophilin 2A2	Human	HEK293	Fc	8918-BT
	Mouse	NS0	His	8997-BT
BTN3A1/CD277	Human	HEK293	Fc	8539-BT
BTNL2/Butyrophilin-like 2	Mouse	NS0	His	8605-BT
VSI3	Human	NS0	Fc	9229-VS
	Mouse	NS0	Fc	Coming Soon
VSI8	Human	CHO	Fc	Coming Soon
	Mouse	NS0	Fc	9204-VS

Ig Superfamily				
B7/CD28 Families				
Molecule	Species	Source	Tag	Catalog #
B7-H7/HLA2	Human	HEK293	Fc	8084-B7
BTLA	Human	NS0	Fc	8385-BT
		HEK293	His	9235-BT
	Mouse	NS0	Fc	3007-BT
CD28	Human	NS0	Fc	342-CD
	Mouse	NS0	Fc, His	483-CD
CD28H/IGPR-1	Human	HEK293	Fc	8316-TR
		HEK293	His	9236-TR
CTLA-4	Human	Sf21 (baculovirus)	His	325-CT
	Human	CHO	Fc	7268-CT
	Mouse	NS0	Fc, His	434-CT
ICOS	Human	NS0	Fc	169-CS
	Mouse	Sf21 (baculovirus)	Fc	168-CS
PD-1	Human	NS0	Fc	1086-PD
	Human	HEK293	His	8986-PD
	Mouse	NS0	Fc	1021-PD
	Mouse	NS0	His	9047-PD
	<i>Cynomolgus</i>	HEK293	His	8509-PD
		Fc	Fc	8578-PD
PD-L2/B7-DC	Human	NS0	Fc	1224-PL
	Human	HEK293	His	9075-PL
	Mouse	NS0	Fc	1022-PL
	Mouse	NS0	His	9107-PL
	<i>Cynomolgus</i>	HEK293	Fc	9178-PL

Ig Superfamily				
Nectin and Nectin-like Binding Receptors				
Molecule	Species	Source	Tag	Catalog #
CD96	Mouse	NS0	His	5690-CD
CD155/PVR	Human	NS0	His	2530-CD
	Human	HEK293	Fc	9174-CD
	Mouse	NS0	His	6909-CD
CRTAM	Human	NS0	Fc	1695-CR
	Mouse	NS0	Fc	3687-CR
DNAM-1/CD226	Human	NS0	Fc	666-DN
	Mouse	NS0	Fc	4436-DN
	<i>Cynomolgus</i>	HEK293	Fc	9276-DN
Nectin-2/CD112	Human	NS0	His	2229-N2
	Mouse	NS0	His	3869-N2
Nectin-3/CD113	Human	NS0	His	3064-N3
TIGIT	Human	CHO	Fc	7898-TG
	Mouse	NS0	Fc	7267-TG



Ig Superfamily				
SLAM Family				
Molecule	Species	Source	Tag	Catalog #
2B4/CD244/SLAMF4	Human	NS0	Fc	1039-2B
	Mouse	NS0	Fc	3514-2B
CD48/SLAMF2	Human	NS0	His	3644-CD
	Mouse	NS0	His	3327-CD
CD58/LFA-3	Human	NS0	His	1689-CD
SLAM/CD150	Human	NS0	His	164-SL
	Mouse	NS0	His	4330-SL

TNF Superfamily				
Type V Subfamily Receptors & Ligands				
Molecule	Species	Source	Tag	Catalog #
4-1BB/TNFRSF9/CD137	Human	NS0	Fc, His	838-4B
		CHO	His	9220-4B
	Mouse	NS0	Fc	937-4B
	Rat	NS0	His	9188-4L
4-1BB Ligand/TNFSF9	Human	<i>E. coli</i>	His	2295-4L
	Mouse	NS0	His	1246-4L
CD27/TNFRSF7	Human	NS0	Fc, His	382-CD
	Mouse	NS0	Fc	574-CD
CD27 Ligand/TNFSF7	Mouse	NS0	His	783-CL
CD30/TNFRSF8	Human	NS0	Fc, His	813-CD
	Human	NS0	none	6126-CD
	Mouse	NS0	Fc, His	852-CD
CD30 Ligand/TNFSF8	Human	NS0	His	1028-CL
	Mouse	NS0	His	732-CL
GITR/TNFRSF18	Human	NS0	Fc	689-GR
	Mouse	NS0	Fc, His	524-GR
	Rat	NS0	Fc	9130-GR
GITR Ligand/TNFSF18	Human	CHO	HA	6987-GL
	Human	Sf21	His	694-GL
	Mouse	NS0	His	2177-GL
OX40/TNFRSF4	Human	NS0	Fc	3388-OX
	Mouse	NS0	Fc	1256-OX
OX40 Ligand/TNFSF4	Human	NS0	His	1054-OX
	Mouse	NS0	His	1236-OX

Ig Superfamily				
TIM Family Receptors & Ligands				
Molecule	Species	Source	Tag	Catalog #
Galectin-3	Human	<i>E. coli</i>	none	1154-GA
	Human	HEK293	none	8259-GA
	Mouse	HEK293	none	9039-GA
TIM-1/KIM-1/HAOCR	Human	NS0	His	1750-TM
	Mouse	NS0	His	1817-TM
TIM-3	Human	NS0	Fc	2365-TM
	Mouse	NS0	Fc	1529-TM
	<i>Cynomolgus</i>	HEK293	Fc	7914-TM
TIM-4	Human	NS0	His	2929-TM
		HEK293	Fc	9300-TM
	Mouse	NS0	His	2826-TI

TNF Superfamily				
Type L Subfamily Receptors & Ligands				
Molecule	Species	Source	Tag	Catalog #
CD40/TNFRSF5	Human	NS0	Fc, His	1493-CD
	Mouse	NS0	Fc, His	1215-CD
CD40 Ligand/TNFSF5	Human	<i>E. coli</i>	none	6245-CL
	Human	HEK293	HA	6420-CL
	Human	<i>E. coli</i>	His	2706-CL*
	Mouse	CHO	HA	8230-CL
DR3/TNFRSF25	Human	NS0	Fc, His	943-D3
	Mouse	NS0	Fc	2437-D3
HVEM/TNFRSF14	Human	NS0	Fc, His	356-HV
	Mouse	CHO	Fc	2516-HV
	<i>Cynomolgus</i>	HEK293	Fc	9197-HV
LIGHT/TNFSF14	Human	NS0	His	664-LI
	Mouse	NS0	His	1794-LT
TL1A/TNFSF15	Human	<i>E. coli</i>	none	1319-TL
	Mouse	<i>E. coli</i>	none	1896-TL

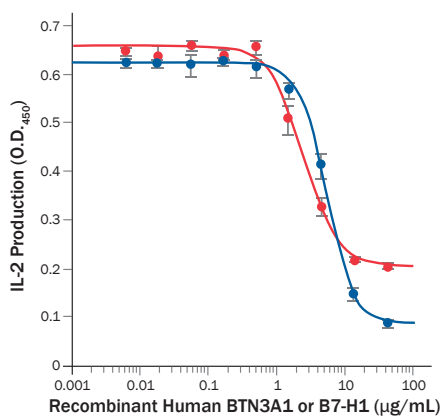
Other Related Ligands, Receptors, and Enzymes				
Molecule	Species	Source	Tag	Catalog #
CD7	Human	HEK293	His	7579-CD
	Mouse	NS0	His	8145-CD
CD160	Human	CHO	His	6177-CD
	Mouse	CHO	His	3899-CD
CD200	Human	NS0	Fc	2724-CD
	Mouse	NS0	Fc	3355-CD
	<i>Cynomolgus</i>	CHO	Fc	9274-CD
CD300a/LMIR1	Human	NS0	Fc	2640-LM
	Mouse	NS0	Fc	1186-LM
Dectin-1/CLEC7A	Human	NS0	His	1859-DC
	Mouse	NS0	His	1756-DC
DPPIV/CD26	Human	NS0	His	1180-SE
	Mouse	NS0	His	954-SE
DPPIV/CD26 (High Purity Dimer)	Human	NS0	His	9168-SE
EphB6	Human	NS0	Fc	3384-B6
	Mouse	NS0	Fc, His	611-B6
Integrin $\alpha 4\beta 1$	Human	CHO	His	5668-A4
	Mouse	CHO	His	6054-A4
Integrin $\alpha 4\beta 7$ /LPAM-1	Human	CHO	His	5397-A3
	Mouse	CHO	His	8615-A3
LAG-3	Human	NS0	Fc	2319-L3
	Mouse	NS0	Fc	3328-L3
LAIR1	Human	NS0	His	2664-LR
	Mouse	NS0	His	4016-LR
TSLP R	Human	NS0	Fc	981-TR
	Mouse	NS0	Fc	546-TR

Fc Receptors Family				
Molecule	Species	Source	Tag	Catalog #
CD23/Fcε RII	Human	NSO	His	123-FE
	Mouse	NSO	His	6040-FE
Fc α/μ R	Human	CHO	His	9278-FC
Fcε RIα	Human	NSO	His	6678-FC
Fcγ RIII (CD16)	Mouse	NSO	His	1960-FC
	<i>Cynomolgus</i>	HEK293	His	9224-FC
Fcγ RI/CD64	Human	NSO	His	1257-FC
	Mouse	NSO	His	2074-FC
	<i>Cynomolgus</i>	HEK293	His	9239-FC
Fcγ RIIA/CD32a (R167)	Human	NSO	His	1330-CD
	<i>Cynomolgus</i>	HEK293	His	9240-CD
Fcγ RIIB/CD32b	Mouse	NSO	His	1460-CD
	<i>Cynomolgus</i>	HEK293	His	9246-CD
Fcγ RIIB/C (CD32b/c)	Human	NSO	His	1875-CD
Fcγ RIIIA/CD16a	Human	NSO	His	4325-FC
Fcγ RIIIA/CD16a V176F Polymorphic Variant	Human	HEK293	His	8894-FC
Fcγ RIIB/CD16b	Human	NSO	His	1597-FC
Fcγ R4/CD16-2	Mouse	NSO	His	1974-CD
FCRL1/FcRH1	Human	NSO	His	2049-FC
	Mouse	NSO	His	7286-FC
FCRL2/FcRH2	Human	NSO	His	2048-FC
FCRL3/FcRH3	Human	NSO	His	3126-FC
FCRL5/FcRH5	Human	NSO	His	2078-FC
	Mouse	NSO	His	6757-FC
FCRLB/FCRY	Human	NSO	His	4705-FC
	Mouse	NSO	His	4868-FC
FCAR/CD89	Human	NSO	His	3939-FA
FCRN	Human	HEK293	His	8639-FC
	Mouse	NSO	His	6775-FC
FCRN Heterodimer	Mouse	NSO	His	9114-FC

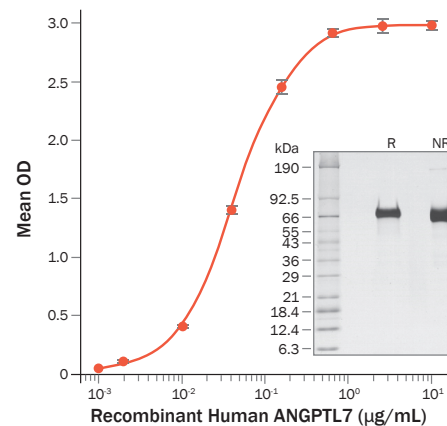
LILRA/B/C Family				
Molecule	Species	Source	Tag	Catalog #
LILRA1/CD85j/LIR-6	Human	NSO	His	9226-T4
LILRA2/CD85h/ILT1	Human	HEK293	His	9040-T4
LILRA4/CD85g/ILT7	Human	NSO	His	8914-T4
LILRA5/CD85f/LIR-9	Human	CHO	His	8956-T4
LILRA6/CD85b/ILT8	Human	HEK293	His	9088-T4
LILRB1/CD85j/ILT2	Human	NSO	Fc	8989-T2
		NSO	Fc	2017-T2
LILRB2/CD85d/ILT4	Human	HEK293	His	8429-T4
		NSO	Fc	2078-T4
LILRB3/CD85a/ILT5	Human	HEK293	His	9159-T5
		NSO	Fc	1806-T5
LILRB4/CD85k/ILT3	Human	NSO	His	8488-T4
	Mouse	NSO	His	9095-T4
LILRB5/CD85c/ILIR-8	Human	NSO	His	8487-T4
LILRC1	Mouse	NSO	His	9288-T4

Kynurenine Pathway			
Molecule	Species	Source	Catalog #
α-Amino adipate Aminotransferase	Human	<i>E. coli</i>	7927-AT
Indoleamine 2,3-dioxygenase/IDO	Human	<i>E. coli</i>	6030-AO
	Mouse	<i>E. coli</i>	9157-AO
Kynureninase	Human	<i>Sf 21</i>	4887-KH
Kynurenine 3-Monooxygenase/KMO	Human	<i>Sf 21</i>	8050-KM

## Butyrophilin and LILRA/B/C Families: Next generation immunotherapy targets



Structurally related Butyrophilins can Inhibit IL-2 Production by Human T Cells in a Manner Similar to B7 Family Members. Human T cells were incubated with immobilized Mouse Anti-Human CD3ε Monoclonal Antibody (Catalog # MAB100; 1 µg/mL) and the indicated concentrations of Recombinant Human BTN3A1 (Catalog # 8539-BT; red) or B7-H1/PD-L1 (Catalog # 156-B7; blue). Secretion of IL-2 was measured in cell culture supernatants using the Human IL-2 Quantikine® ELISA Kit (Catalog # D2050). The ED<sub>50</sub> for this effect is approximately 2 µg/mL for BTN3A1/CD277 and 5 µg/mL for B7-H1/PD-L1.



LILRB2 is a Receptor for Angiopoietin-like 7. Recombinant Human LILRB2/CD85d/ILT4 (Catalog # 8429-T4) was coated onto a microplate at 2 µg/mL. Recombinant Human Angiopoietin-like 7 (Catalog # 914-AN) binds with an ED<sub>50</sub> of approximately 75 ng/mL. The silver-stained SDS-PAGE gel highlights purity under both reducing and non-reducing (NR) conditions (inset).

# GMP Proteins for Cell Therapy and Regenerative Medicine

We offer both research and GMP proteins, easing the transition from research to clinical applications

GMP-grade Protein	Catalog #
Activin A*	338-GMP
BDNF**	248-GMP
BMP-2	355-GMP
BMP-4	314-GMP
BMP-7	354-GMP
Dkk-1	5439-GMP
EGF	236-GMP
FGF basic	233-GMP
Fibronectin	4305-GMP
Flt-3 Ligand	308-GMP
GDF-8/Myostatin*	788-GMP
GDF-11*	1958-GMP
GDNF	212-GMP
GM-CSF	215-GMP
Hepsin	4776-GMP
HGF	294-GMP

GMP-grade Protein	Catalog #
IFN- $\gamma$	285-GMP
IGF-I	291-GMP
IL-1 $\beta$ /IL-1F2	201-GMP
IL-2	202-GMP
IL-3	203-GMP
IL-4	204-GMP
IL-6	206-GMP
IL-7	207-GMP
IL-11	218-GMP
IL-12	219-GMP
IL-15	247-GMP
IL-17E	1258-GMP
KGF/FGF-7	251-GMP
LR3 IGF-I	8335-GMP
M-CSF	216-GMP
Noggin	6057-GMP

GMP-grade Protein	Catalog #
Noggin Fc Chimera	3344-GMP
NRG1- $\beta$ 1/HRG1- $\beta$ 1	396-GMP
NT-3	267-GMP
NT-4	268-GMP
PDGF-BB	220-GMP
Periostin/OSF-2	3548-GMP
SCF/c-kit Ligand	255-GMP
Sonic Hedgehog/Shh N-Terminus	1314-GMP
Sonic Hedgehog/Shh (C24II) N-Terminus	1845-GMP
TGF- $\beta$ 1	240-GMP
TGF- $\beta$ 3	243-GMP
TNF- $\alpha$	210-GMP
VEGF	293-GMP
Wnt-3a	5036-GMP

All GMP proteins listed are Human.

\*Also Mouse/Rat. \*\*Also Mouse/Rat/Canine/Equine.

## Documentation

ISO 9001-, ISO 13485-certified facility, lot-to-lot consistency, materials traceability, employee training documentation, equipment maintenance and monitoring records, Drug Master Files, and more.

## Regulatory Guidelines Followed

GMP proteins are manufactured in compliance of the applicable sections of World Health Organization:

1. TRS, No 822, 1992 Annex 1 Good Manufacturing Practices for biological products.
2. USP Chapter 1043, Ancillary Materials for Cell, Gene, and Tissue-Engineered Products.
3. USP Chapter 92, Cytokines used in Cell Therapy Manufacturing.

## Quality Control Testing

Mass spectrometry, HPLC, SDS-PAGE, endotoxin, presence of host cell content, adventitious agents, and more.

## Satisfied Clients

Clients include more than 100 pharmaceutical and biotech companies and we regularly welcome audits of our facilities.



# CellXVivo™ Kits for Immune Cell Differentiation

CellXVivo™ Immune Cell Differentiation and Expansion Kits are an efficient, simple, and reliable way to differentiate lymphoid and myeloid immune cells *ex vivo*. These kits contain optimized combinations of R&D Systems® high-quality cytokines and antibodies.

## Benefits

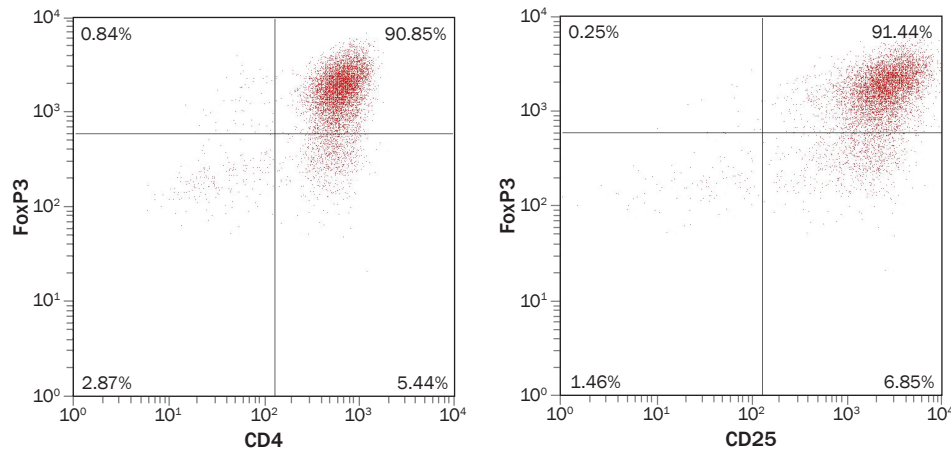
- Guaranteed to produce consistent and reliable results
- Cost-effective and time-saving
- Conveniently packages all reagents needed for immune cell differentiation or expansion

## Features

- Includes optimized combinations of R&D Systems® high-quality proteins and antibodies
- Simple and optimized protocols
- Quality controlled for consistency and reliability
- Does not require specialized instrumentation

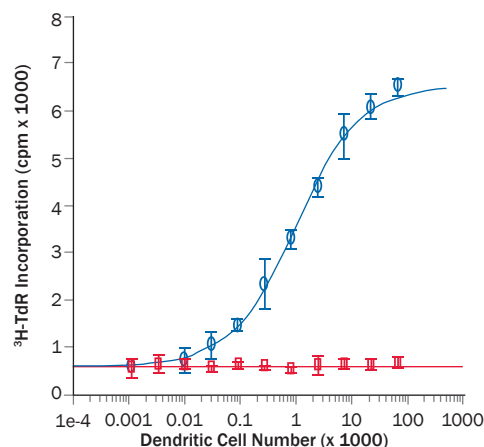
CellXVivo™ Kit	Species	Description	Catalog #
B Cell Expansion Kit	Human	For the <i>ex vivo</i> expansion of B cells	CDK005
CIK Cell Expansion Kit	Human	Expands human CD3 <sup>+</sup> CD56 <sup>+</sup> cytokine-induced killer cells from PBMCs	CDK014
NK Cell Expansion Kit	Human	Expands human CD3 <sup>+</sup> CD56 <sup>+</sup> natural killer cells from PBMCs	CDK015
Th1 Cell Differentiation Kit	Human	Differentiates CD4 <sup>+</sup> lymphocytes into mature Th1 effector cells	CDK001
Th2 Cell Differentiation Kit	Human	Differentiates CD4 <sup>+</sup> lymphocytes into mature Th2 effector cells	CDK002
Th17 Cell Differentiation Kit	Human	Differentiates CD4 <sup>+</sup> lymphocytes into mature Th17 effector cells	CDK003C
Treg Cell Differentiation Kit	Human	Differentiates CD4 <sup>+</sup> human lymphocytes into CD25 <sup>+</sup> FoxP3 <sup>+</sup> regulatory T cells	CDK006
	Mouse		CDK007
Monocyte-derived Dendritic Cell Differentiation Kit	Human	Differentiate CD14 <sup>+</sup> monocytes into monocyte-derived dendritic cells	CDK004
	Mouse	Differentiate mouse bone marrow cells into dendritic cells	CDK008
M1 Macrophage Differentiation Kit	Human	Differentiate CD14 <sup>+</sup> monocytes into M1 Macrophages	CDK012
M2 Macrophage Differentiation Kit	Human	Differentiate CD14 <sup>+</sup> monocytes into M2 Macrophages	CDK013

## Human Treg Differentiation Kit (Catalog # CDK006)



**Differentiation of Human CD4<sup>+</sup> T Cells into Treg Cells Confirmed by FoxP3 and CD25 Expression.** Human peripheral blood naïve CD4<sup>+</sup> T cells were incubated with reagents included in the Human Treg Cell Differentiation Kit for 5 days. Cells were fixed, permeabilized, and stained using the FlowX™ Human Regulatory T Cell Kit (Catalog # FMC021). Cells were imaged using flow cytometry. Quadrants were set based on isotope-stained samples.

## Human Dendritic Cell Differentiation Kit (Catalog # CDK004)



**Mature Dendritic Cells Induce Proliferation of Allogeneic T-cells.** Serial dilutions of day 10 TNF- $\alpha$  treated mature dendritic cells were incubated with allogeneic (blue) or autologous (red) human T cells for 3 days. <sup>3</sup>H-Thymidine (<sup>3</sup>H-TdR) was added to the culture for the final 18 hours. Cells were harvested and the incorporation of <sup>3</sup>H-TdR was measured using a scintillation counter. Results are presented as the mean cpm of triplicates.

## Antibodies for Blocking/Neutralization or the Detection of T Cell Co-Signaling Molecules

R&D Systems offers multiple Anti-Mouse or Anti-Human antibodies for blocking/neutralization of T cell co-signaling molecules including Anti-Human and Anti-Mouse B7-1/CD80, B7-2/CD86, and PD-L2 antibodies, Anti-Human B7-H1/PD-L1, B7-H2/ICOS L, B7-H7, and PD-1 antibodies, and Anti-Mouse B7-H3, CTLA-4, and ICOS antibodies. In addition, we offer a wide selection of unconjugated and fluorochrome-conjugated antibodies that are qualified for flow cytometry (FC), immunofluorescence/immunocytochemistry (IF/ICC), immunohistochemistry (IHC), and/or Western blot (WB). All of our antibodies are 100% guaranteed to work in the application and species listed on the R&D Systems website.

Molecule	Species	Clone	Unconjugated Antibodies Catalog # (Applications)	Fluorochrome-conjugated Antibodies Catalog # (Applications)
<b>Ig Superfamily</b>				
<b>B7/CD28 Families</b>				
B7-1/CD80	Human	37711	MAB140 (B/N, E, FC, IHC)	FAB140F, P (FC)
	Human	Polyclonal	AF140 (IHC, WB)	
	Mouse	111114	MAB740 (IHC, WB)	
	Mouse	Polyclonal	AF740 (B/N, E, FC, ICC/IF, WB)	
B7-2/CD86	Human	37301	MAB141 (B/N, FC, WB)	FAB141A, C, F, N, P, R, T (FC)
	Human	Polyclonal	AF-141-NA (B/N, FC, IHC, WB)	
	Mouse	GL1	MAB741 (B/N, FC, WB)	FAB741A, C, G, P (FC)
	Mouse	Polyclonal	AF-441-NA (B/N, WB)	
B7-H1/PD-L1	Human	130021	MAB1561 (FC, IHC)	FAB1561A, C, G, N, P, R, T, V (FC)
	Human	Polyclonal	AF156 (B/N, IHC, WB)	
	Mouse	179711	MAB1019 (WB)	
	Mouse	929903	MAB9078 (FC)	FAB9078R, T (FC)
	Mouse	Polyclonal	AF1019 (FC, IHC, WB)	FAB1019A, F (FC)
B7-H2/ICOS L	Human	136726	MAB165 (B/N, FC)	FAB165A, C, P (FC)
	Human	136716	MAB1651 (B/N, WB)	
	Human	Polyclonal	AF165 (FC, WB)	
	Mouse	599841	MAB158 (FC, ICC/IF)	FAB158A, P (FC)
	Mouse	Polyclonal	AF158 (ICC/IF, WB)	
B7-H3	Human	185504	MAB1027 (FC, WB)	FAB1027A, F, N, P, T, V (FC)
	Human	Polyclonal	AF1027 (FC, IHC, SW, WB)	
	Mouse	Polyclonal	AF1397 (B/N, WB)	
B7-H4	Human	935317	MAB6576 (FC)	FAB6576P, R (FC)
	Mouse	297219	MAB2154 (FC, WB)	FAB2154A, G, P (FC)
	Mouse	Polyclonal	AF2154 (FC, WB)	
B7-H5/VISTA/PD-1H	Human	730804	MAB71261 (FC, ICC/IF)	FAB71261A, G, N, P, R, S, T, V (FC)
	Human/Mouse	730802	MAB7126 (WB)	
	Mouse	742002	MAB70051 (ICC/IF, WB)	
	Mouse	Polyclonal	AF7005 (FC, ICC/IF, WB)	FAB7005A, G (FC)
B7-H7/HHLA2	Human	907812	MAB80841 (B/N, ICC/IF)	FAB80841R, T (FC)
	Human	907816	MAB8084 (ICC/IF)	
BTLA	Human	330104	MAB3354 (WB)	
	Human	Polyclonal	AF3354 (FC, WB)	FAB3354A, C (FC)
	Mouse	753131	MAB7600 (WB)	FAB7600A, G (FC)
	Mouse	Polyclonal	AF3007 (WB)	FAB3007G, P (FC)
CD28	Human	37407	MAB342 (FA, FC, WB)	FAB342P (FC)
	Human	Polyclonal	AF-342-PB (FA, FC, ICC/IF, WB)	
	Mouse	61109	MAB4831 (WB)	
	Mouse	794716	MAB4832 (FC)	FAB4832A, G, P (FC)
	Mouse	Polyclonal	AF483 (WB)	

**Application Key:** B/N Blocking/Neutralization E ELISA FA Functional Assay FC Flow Cytometry ICC/IF Immunocytochemistry/Immunofluorescence IHC Immunohistochemistry SW Simple Western WB Western Blot

**Fluorochrome Key for FAB/IC Catalog Numbers Ending In:** A: Allophycocyanin; C: PerCP; F: Fluorescein; G: Alexa Fluor® 488; N: Alexa Fluor® 700; P: Phycoerythrin; R: Alexa Fluor® 647; S: Alexa Fluor® 750; T: Alexa Fluor® 594; V: Alexa Fluor® 405

Molecule	Species	Clone	Unconjugated Antibodies Catalog # (Applications)	Fluorochrome-conjugated Antibodies Catalog # (Applications)
CTLA-4	Human	48815	MAB325 (WB)	
	Human	Polyclonal	AF-386-PB (FC, ICC/IF, WB)	FAB386A, P (FC)
	Mouse	63828	MAB434 (B/N, FC, WB)	FAB434A, F, P (FC)
	Mouse	Polyclonal	AF476 (E, WB)	
ICOS	Human	669222	MAB6975 (FC)	FAB6975A, P (FC)
	Human	Polyclonal	AF169 (IHC, WB)	
	Mouse	670306	MAB168 (FC)	FAB168A, P (FC)
	Mouse	Polyclonal	AF168 (B/N, WB)	
PD-1	Human	192106	MAB1086 (WB)	
	Human	913429	MAB10861 (FC)	
	Human	Polyclonal	AF1086 (B/N, E, FC, IHC, WB)	FAB7115G, P (FC)
	Mouse	766104	MAB7738 (FC)	FAB7738A, G, P (FC)
	Mouse	Polyclonal	AF1021 (FC, IHC, WB)	FAB1021F, P (FC)
PD-L2/B7-DC	Human	176611	MAB1224 (FC, IHC, WB)	FAB1224A, G, P (FC)
	Human	Polyclonal	AF1224 (B/N, IHC, WB)	
	Mouse	168633	MAB1022 (FC, WB)	
	Mouse	Polyclonal	AF1022 (B/N, FC, IHC, WB)	FAB1022F, P (FC)
<b>Butyrophilins</b>				
BTN1A1/Butyrophilin	Mouse	Polyclonal	AF4765 (WB)	
BTN2A2/Butyrophilin 2A2	Human	Polyclonal	AF8645 (IHC, WB)	
	Mouse	Polyclonal	AF4917 (WB)	
BTN3A1/CD277	Human	849203	MAB7136 (FC)	FAB7136A, G, P (FC)
BTN3A1/2	Human	Polyclonal	AF7136 (WB)	
BTNL2/Butyrophilin-like 2	Mouse	Polyclonal	AF5236 (WB)	
<b>Nectin and Nectin-like Binding Receptors</b>				
CD96	Human	Polyclonal	AF6199 (WB)	
	Mouse	630612	MAB5690 (FC)	FAB5690A, P (FC)
	Mouse	Polyclonal	AF5690 (WB)	
CD96v2	Human	628211	MAB6199 (FC)	FAB6199A (FC)
	Human	628226	MAB61991 (WB)	
CD155/PVR	Human	300907	MAB25301 (FC, ICC/IF, WB)	FAB25301A, C, F, P (FC)
	Human	300903	MAB2530 (ICC/IF, WB)	
	Human	Polyclonal	AF2530 (ICC/IF, SW, WB)	
	Mouse	690912	MAB6909 (FC, ICC/IF, WB)	FAB6909A, G, P (FC)
CRTAM	Human	210213	MAB16951 (FC, WB)	FAB16951A, P (FC)
	Human	210206	MAB1695 (WB)	
	Human	Polyclonal	AF1695 (E, WB)	
DNAM-1/CD226	Human	102511	MAB666 (B/N, FC, WB)	FAB666A, F, P (FC)
	Human	Polyclonal	AF666 (B/N, WB)	
	Mouse	838216	MAB4436 (FC)	FAB4436A, P (FC)
	Mouse	Polyclonal	AF4436 (WB)	
Nectin-2/CD112	Human	610603		FAB2229A, G, N, P (FC)
	Human	Polyclonal	AF2229 (WB)	
	Mouse	829038	MAB3869 (FC)	FAB3869A, G, P (FC)
	Mouse	Polyclonal	AF3869 (WB)	
Nectin-3/CD113	Human	337407	MAB3064 (WB)	
	Human	Polyclonal	AF3064 (FC, IHC, WB)	
	Mouse	Polyclonal	AF3498 (WB)	
TIGIT	Human	741182	MAB7898 (FC)	FAB7898A, C, N, P (FC)
	Mouse	Polyclonal	AF7267 (FC)	FAB7267A, G (FC)

**Application Key:** B/N Blocking/Neutralization E ELISA FA Functional Assay FC Flow Cytometry ICC/IF Immunocytochemistry/Immunofluorescence IHC Immunohistochemistry SW Simple Western WB Western Blot

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Molecule	Species	Clone	Unconjugated Antibodies Catalog # (Applications)	Fluorochrome-conjugated Antibodies Catalog # (Applications)
<b>SLAM Family</b>				
2B4/CD244/SLAMF4	Human	146510	MAB1039 (IHC, WB)	
	Human	Polyclonal	AF1039 (E, FA, FC, IHC, WB)	FAB1039F, P (FC)
	Mouse	Polyclonal	AF1050 (FC, IHC, WB)	
CD48/SLAMF2	Human	394607	MAB3644 (FC, WB)	FAB3644A, P (FC)
	Human	394620	MAB36441 (ICC/IF, WB)	
	Human	Polyclonal	AF3644 (FC, WB)	
	Mouse	331504	MAB3327 (FC, WB)	
	Mouse	Polyclonal	AF3327 (E, FC, ICC/IF, WB)	
CD58/LFA-3	Human	248310	MAB1689 (FC, WB)	FAB1689A (FC)
	Human	Polyclonal	AF1689 (B/N, IHC, WB)	
SLAM/CD150	Human	542301	MAB1642 (FC, WB)	FAB1642F, P (FC)
	Human	123317	MAB164 (WB)	
	Human	Polyclonal	AF164 (FC, WB)	
	Mouse	459911	MAB4330 (E, FC)	FAB4330F (FC)
	Mouse	Polyclonal	AF4330 (FC, WB)	
<b>TIM Family Receptors &amp; Ligands</b>				
Galectin-3	Human	194801	MAB11542 (FC, WB)	IC11542P (FC)
	Human	194804	MAB1154 (WB)	
	Human	194805	MAB11541 (E, SW, WB)	
	Human	Polyclonal	AF1154 (FC, IHC, SW, WB)	IC1154A, G (FC)
	Mouse	202213	MAB1197 (E, SW, WB)	FAB1197G, P (FC)
	Mouse	Polyclonal	AF1197 (IHC, SW, WB)	
TIM-1/KIM-1/HAVCR	Human	219211	MAB1750 (FC, IHC, WB)	FAB1750G, P (FC)
	Human	Polyclonal	AF1750 (E, IHC, WB)	
	Mouse	222414	MAB1817 (E, WB)	FAB1817A (FC)
	Mouse	Polyclonal	AF1817 (WB)	
TIM-3	Human	344801	MAB23651 (FA)	
	Human	344823	MAB2365 (FC)	FAB2365A, C, G, N, P, R, S, T (FC)
	Human	Polyclonal	AF2365 (FC, WB)	
	Mouse	215008		FAB1529A, C, G, P (FC)
	Mouse	215015	MAB15291 (WB)	
	Mouse	Polyclonal	AF1529 (FC, WB)	
TIM-4	Human	921832	MAB2929 (FC)	FAB2929A, N, P, R, T (FC)
	Human	Polyclonal	AF2929 (WB)	
	Mouse	Polyclonal	AF2826 (WB)	
<b>TNF Superfamily</b>				
<b>Type V Subfamily Receptors &amp; Ligands</b>				
4-1BB/TNFRSF9/CD137	Human	145501	MAB838 (FC, WB)	FAB838P (FC)
	Human	Polyclonal	AF838 (E, FA, FC, ICC/IF, IHC, WB)	
	Mouse	158306	MAB9372 (B/N, WB)	
	Mouse	158321	MAB9371 (FA)	
	Mouse	158332	MAB937 (E, FC, WB)	FAB937P (FC)
	Mouse	Polyclonal	AF937 (FA, FC, IHC, WB)	
4-1BB Ligand/TNFSF9	Human	282220	MAB2295 (FC, WB)	FAB2295A, P (FC)
	Human	Polyclonal	AF2295 (FC, IHC, WB)	
	Mouse	203942	MAB1246 (FC, WB)	FAB1246F, P (FC)
	Mouse	Polyclonal	AF1246 (WB)	
<b>Application Key:</b> B/N Blocking/Neutralization E ELISA FA Functional Assay FC Flow Cytometry ICC/IF Immunocytochemistry/Immunofluorescence IHC Immunohistochemistry <b>SW</b> Simple Western <b>WB</b> Western Blot				
<b>Fluorochrome Key for FAB/IC Catalog Numbers Ending In:</b> A: Allophycocyanin; C: PerCP; F: Fluorescein; G: Alexa Fluor® 488; N: Alexa Fluor® 700; P: Phycoerythrin; R: Alexa Fluor® 647; S: Alexa Fluor® 750; T: Alexa Fluor® 594; V: Alexa Fluor® 405				

Molecule	Species	Clone	Unconjugated Antibodies Catalog # (Applications)	Fluorochrome-conjugated Antibodies Catalog # (Applications)
CD27/TNFRSF7	Human	57703	MAB382 (B/N, FC, WB)	FAB3832A, F, P (FC)
	Human	Polyclonal	AF382 (B/N, FC, IHC, SW, WB)	
	Human/Mouse	Polyclonal	AF574 (FC, ICC/IF, WB)	
	Mouse	137910	MAB574 (ICC/IF, WB)	
	Mouse	137915	MAB5741 (E, FC, ICC/IF)	FAB5741A, P (FC)
CD27 Ligand/TNFSF7	Human	301731	MAB2738 (ICC/IF, WB)	
	Human	Polyclonal	AF2738 (FC, WB)	
	Mouse	118510	MAB783 (B/N, E)	
	Mouse	Polyclonal	AF783 (B/N, WB)	FAB783P (FC)
CD30/TNFRSF8	Human	81316	MAB2291 (WB)	
	Human	81337	MAB229 (FA, FC, WB)	FAB229F, P (FC)
	Human	Polyclonal	AF229 (FA, ICC/IF, WB)	
	Mouse	115705	MAB8521 (E, WB)	
	Mouse	Polyclonal	AF852 (FA, ICC/IF, WB)	
CD30 Ligand/TNFSF8	Human	116614	MAB1028 (B/N, FC)	FAB1028A, P (FC)
	Human	116615	MAB774 (WB)	
	Human	Polyclonal	AF1028 (FC, IHC, WB)	
	Mouse	82414	MAB732 (E, WB)	FAB732A (FC)
	Mouse	Polyclonal	AF732 (B/N, WB)	
GITR/TNFRSF18	Human	110416	MAB689 (B/N, E, FC, WB)	FAB689A, F, G, N, P (FC)
	Human	Polyclonal	AF689 (B/N, FC, IHC, WB)	
	Mouse	108619	MAB5241 (FC, WB)	FAB5241A, F, P (FC)
	Mouse	108626	MAB524 (E, WB)	
	Mouse	Polyclonal	AF524 (WB)	
GITR Ligand/TNFSF18	Human	109101	MAB6941 (B/N, FC)	FAB6941A, C, F, N, P (FC)
	Human	109114	MAB6942 (B/N, E, FC)	
	Human	Polyclonal	AF694 (B/N, FC, WB)	
	Mouse	337122	MAB2177 (B/N, E)	
	Mouse	721926	MAB21772 (WB)	
OX40/TNFRSF4	Human	443318	MAB3388 (FC, WB)	FAB3388A, F, P (FC)
	Human	Polyclonal	AF3388 (FC, WB)	
	Mouse	Polyclonal	AF1256 (FA, WB)	FAB1256P (FC)
OX40 Ligand/TNFSF4	Human	159403	MAB10541 (B/N, FC, ICC/IF)	FAB10541A, C, P (FC)
	Human	159408	MAB1054 (WB)	
	Human	Polyclonal	AF1054 (B/N, WB)	
	Mouse	182601	MAB1236 (B/N, WB)	
	Mouse	Polyclonal	AF1236 (B/N, ICC/IF, WB)	FAB1236F, P (FC)
<b>Type L Subfamily Receptors &amp; Ligands</b>				
CD40/TNFRSF5	Human	82102	MAB6322 (B/N, WB)	
	Human	82111	MAB6321 (FA, FC, ICC/IF)	FAB6321A, P (FC)
	Human	Polyclonal	AF632 (FA, WB)	
	Mouse	1C10	MAB440 (FA, FC, IP)	FAB440F (FC)
	Mouse	65924	MAB4401 (E, FC, WB)	
	Mouse	Polyclonal	AF440 (ICC/IF, WB)	
CD40 Ligand/TNFSF5	Human	40804	MAB617 (B/N, FC, IHC, WB)	FAB617A, C, F, P (FC)
	Human	938601	MAB6171 (WB)	
	Human	Polyclonal	AF617 (FC, WB)	
	Mouse	208109	MAB1163 (B/N, FC)	FAB1163A, F, P (FC)
	Mouse	Polyclonal	AF1163 (B/N, ICC/IF, WB)	

**Application Key:** B/N Blocking/Neutralization E ELISA FA Functional Assay FC Flow Cytometry ICC/IF Immunocytochemistry/Immunofluorescence IHC Immunohistochemistry SW Simple Western WB Western Blot

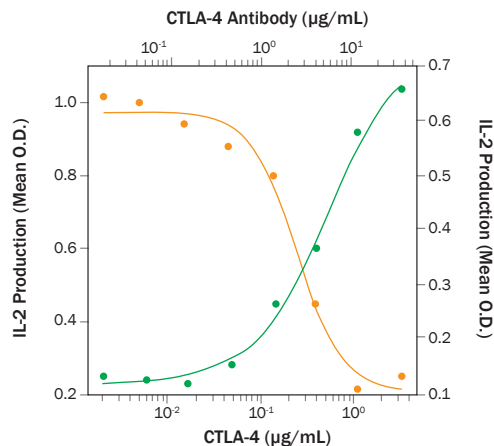
**Fluorochrome Key for FAB/IC Catalog Numbers Ending In:** A: Allophycocyanin; C: PerCP; F: Fluorescein; G: Alexa Fluor® 488; N: Alexa Fluor® 700; P: Phycoerythrin; R: Alexa Fluor® 647; S: Alexa Fluor® 750; T: Alexa Fluor® 594; V: Alexa Fluor® 405



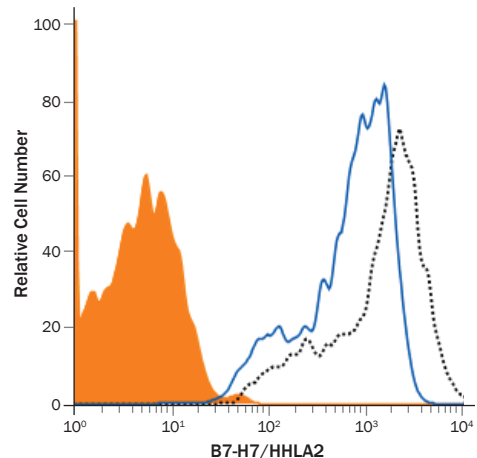
Molecule	Species	Clone	Unconjugated Antibodies Catalog # (Applications)	Fluorochrome-conjugated Antibodies Catalog # (Applications)
DR3/TNFRSF25	Human	Polyclonal	AF943 (WB)	
	Human/Mouse	59204	MAB943 (FC, WB)	FAB943A, P (FC)
	Mouse	Polyclonal	AF2437 (IHC, WB)	
HVEM/TNFRSF14	Human	94801	MAB356 (E, FC, WB)	FAB356A (FC)
	Human	94804	MAB3561 (IHC, WB)	
	Human	Polyclonal	AF356 (IHC, WB)	
	Mouse	Polyclonal	AF2516 (WB)	
LIGHT/TNFSF14	Human	115520	MAB664 (E, FC)	FAB664A, P (FC)
	Human	Polyclonal	AF664 (B/N, IHC, WB)	
	Mouse	261639	MAB1794 (WB)	
	Mouse	Polyclonal	AF1794 (WB)	
TL1A/TNFSF15	Human	Polyclonal	AF744 (IHC, WB)	
	Human/Mouse	293327	MAB7441 (B/N, WB)	
	Mouse	820446	MAB1896 (B/N)	
<b>Others</b>				
CD160	Human	688327	MAB6700 (FC)	FAB6700A, G, N, P (FC)
	Human	Polyclonal	AF6177 (WB)	
	Mouse	342713	MAB3899 (WB)	
	Mouse	342705	MAB38991 (ICC/IF)	
	Mouse	Polyclonal	AF3899 (FC, ICC/IF)	
LAIR1	Human	342219	MAB2664 (FC, WB)	FAB2664A, F, P (FC)
	Human	Polyclonal	AF2664 (FC, WB)	

**Application Key:** B/N Blocking/Neutralization E ELISA FA Functional Assay FC Flow Cytometry ICC/IF Immunocytochemistry/Immunofluorescence IHC Immunohistochemistry SW Simple Western WB Western Blot

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**CTLA-4-mediated Inhibition of B7-1/CD80-induced IL-2 Secretion and Neutralization using an Anti-Mouse CTLA-4 Antibody.** The Jurkat human acute T cell leukemia cell line was treated with 3 µg/mL Recombinant Human B7-1/CD80 Fc Chimera (Catalog # 140-B1) and increasing concentrations of Recombinant Mouse CTLA-4 Fc Chimera (Catalog # 434-CT). IL-2 secretion was measured using the Human IL-2 Quantikine® ELISA Kit (Catalog # D2050; orange line). Inhibition of Recombinant Human B7-1/CD80 Fc Chimera (3 µg/mL) activity elicited by 1 µg/mL Recombinant Mouse CTLA-4 Fc Chimera was neutralized by treating the cells with increasing concentrations of a Rat Anti-Mouse CTLA-4 Monoclonal Antibody (Catalog # MAB434; green line). The ND<sub>50</sub> is typically 2.5–10 µg/mL in the presence of PHA (10 µg/mL).



**CD28H Binding to B7-H7-transfected HEK293 Cells is Blocked by an Anti-Human B7-H7 Antibody.** In a functional flow cytometry test, biotinylated recombinant human CD28H/IGPR-I (10 ng/mL) bound to the HEK293 human embryonic kidney cell line that had been transfected with human B7-H7 (black line). This binding was completely blocked by 2.5 µg/mL of the Mouse Anti-Human B7-H7 Monoclonal Antibody (Catalog # MAB80841; orange histogram). The same concentration of a Mouse IgG<sub>1</sub> Isotype Control Antibody (Catalog # MAB002) was used as a control (blue line). Cells were stained with APC-conjugated Streptavidin (Catalog # F0050).

## ELISA Kits for T Cell Co-Signaling Molecules

R&D Systems offers complete, ready-to-run Quantikine® ELISA Kits and the more flexible DuoSet® ELISA Development Systems for detecting soluble T cell co-signaling molecules. We offer Quantikine® Kits for detecting Human B7-H1, B7-H3, TIM-1, TIM-3, Galectin-3, CD40, CD40 Ligand, and LIGHT and DuoSet® ELISA Development Systems for many additional T cell co-signaling molecules.

### Quantikine® ELISA Kit Features

- Complete, ready-to-use kits
- Exhaustively tested for superior quality and reproducibility
- Detailed protocol booklets
- Colorimetric detection

### DuoSet® ELISA Development System Features

- Contains all of the essential components required to develop an immunoassay for a specific target, but requires the user to set up the assay
- Contains carefully selected and validated antibodies, reducing development time
- Provides sufficient reagents for five or fifteen 96-well plates
- Includes mass-calibrated recombinant standard, reducing assay variability
- Can be adapted for use across multiple platforms

Molecule	Species	Quantikine® ELISA Kits (Catalog #)	DuoSet® ELISA Development Systems (Catalog #)
<b>Ig Superfamily</b>			
<b>B7/CD28 Families</b>			
B7-1/CD80	Human		DY140
	Mouse		DY740
B7-H1/PD-L1	Human	DB7H10	DY156
	<i>Cynomolgus</i>	DB7H10	
B7-H3	Human	DB7H30	DY1949
B7-H5/VISTA	Mouse		DY7005
CTLA-4	Mouse		DY476
ICOS	Human		DY169
PD-1	Human		DY1086
	Mouse		DY1021
PD-L2/B7-DC	Human		DY1224
<b>Nectin and Nectin-like Binding Receptors</b>			
CRTAM	Human		DY1695
<b>SLAM Family</b>			
CD48/SLAMF2	Mouse		DY3327
SLAM/CD150	Human		DY164
	Mouse		DY4330
<b>TIM Family Receptors &amp; Ligands</b>			
Galectin-3	Human	DGAL30	DY1154
	Mouse		DY1197
TIM-1/KIM-1/HAOCR	Human	DKM100	DY1750B
	Mouse	MKM100	DY1817
TIM-3	Human	DTIM30	DY2365

**NEW!**

### Human/Cynomolgus Monkey B7-H1/PD-L1 Quantikine® ELISA Kit (Catalog # DB7H10)

This kit accurately measures PD-L1 levels as low as 25 pg in human or cynomolgus monkey serum, plasma, urine, cell culture supernates, and cell lysates.



Molecule	Species	Quantikine® ELISA Kits (Catalog #)	DuoSet® ELISA Development Systems (Catalog #)
<b>TNF Superfamily</b>			
<b>Type V Subfamily Receptors &amp; Ligands</b>			
4-1BB/TNFRSF9/CD137	Human		DY838
	Mouse		DY937
CD27/TNFRSF7	Human		DY382
	Mouse		DY574
CD27 Ligand/TNFSF7	Mouse		DY783
CD30/TNFRSF8	Human		DY6126
	Mouse		DY852
CD30 Ligand/TNFSF8	Human		DY732
	Mouse		DY689
GITR/TNFRSF18	Human		DY694
	Mouse		DY524
GITR Ligand/TNFSF18	Human		DY694
	Mouse		DY2177
OX40 Ligand/TNFSF4	Mouse		DY1236
<b>Type L Subfamily Receptors &amp; Ligands</b>			
CD40/TNFRSF5	Human	DCCD40	DY632
	Mouse	MCCD40	DY097
CD40 Ligand/TNFSF5	Human	DCDL40	DY617
	Mouse		DY1163
DR3/TNFRSF25	Human		DY943
	Mouse		DY2437
HVEM/TNFRSF14	Human		DY356
LIGHT/TNFSF14	Human	DLIT00	DY664
	Mouse		DY1794

# Monitor Immune Responses with Multiplex Assays

## Luminex® Assays and Instruments

Luminex® Assays offer flexibility, require only a small sample volume (<50 µL), and are cost-effective. Select one of our pre-defined High Performance Assays or choose from over 340 analytes and build your own panel of up to 100 analytes.



High Performance Assay	Analytes	Bead Format
Human Cytokine Panel A	<ul style="list-style-type: none"> <li>CCL2/MCP-1 • CCL3/MIP-1<math>\alpha</math> • CCL4/MIP-1<math>\beta</math></li> <li>CCL5/RANTES • CXCL5/ENA-78 • CXCL8/IL-8 • FGF basic</li> <li>G-CSF • GM-CSF • IFN-<math>\gamma</math> • IL-1<math>\alpha</math>/IL-1F1 • IL-1<math>\beta</math>/IL-1F2</li> <li>IL-1ra/IL-1F3 • IL-2 • IL-4 • IL-5 • IL-6 • IL-10 • IL-17</li> <li>TNF-<math>\alpha</math> • Thrombopoietin/Tpo • VEGF</li> </ul>	Magnetic & Polystyrene
Human High Sensitivity Cytokine Panel A	<ul style="list-style-type: none"> <li>CXCL8/IL-8 • GM-CSF • IFN-<math>\gamma</math> • IL-1<math>\beta</math>/IL-1F2 • IL-2 • IL-4</li> <li>IL-5 • IL-6 • IL-10 • IL-12 p70 • TNF-<math>\alpha</math> • VEGF</li> </ul>	Magnetic & Polystyrene

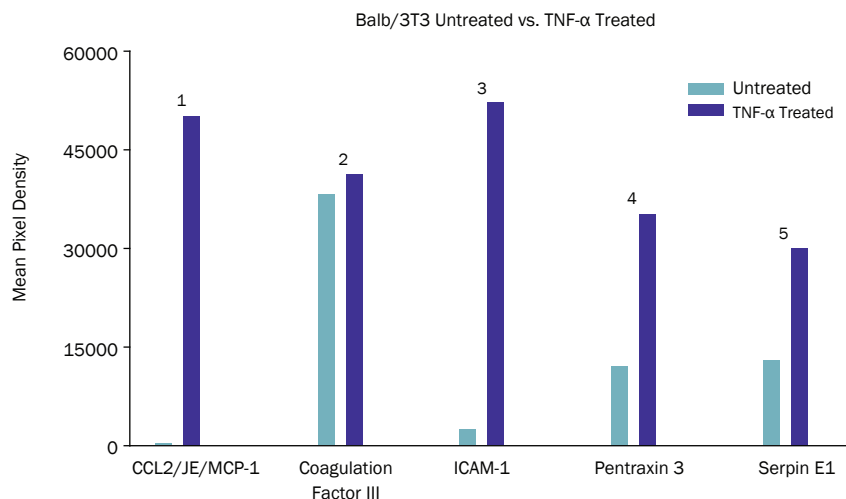
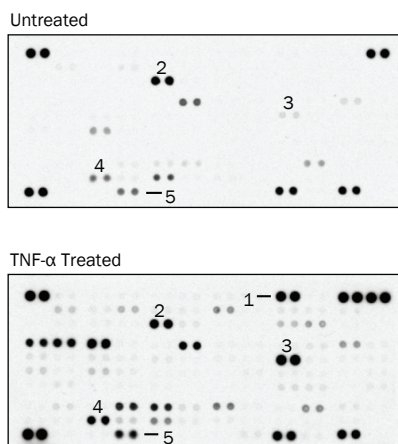
Luminex® instrumentation systems can now be obtained from Bio-Techne. Please contact a Bio-Techne sales representative for more information: [sales@bio-techne.com](mailto:sales@bio-techne.com)

Learn more | [rndsystems.com/luminex](http://rndsystems.com/luminex)

## Proteome Profiler™ Antibody Arrays

Our antibody arrays allow you to analyze the expression levels of up to 111 cytokines simultaneously, using only standard Western blotting equipment.

Proteome Profiler™ Antibody Array	Measures	Catalog #
Human XL Cytokine Array	102 cytokines	ARY022
Mouse XL Cytokine Array	111 cytokines	ARY028
Human Cytokine Array	36 cytokines	ARY005B
Mouse Cytokine Array	40 cytokines	ARY006
Rat Cytokine Array	29 cytokines	ARY008



Cytokine Profile of TNF- $\alpha$ -treated Balb/3T3 Cells Measured with the Proteome Profiler™ Mouse XL Cytokine Array (Catalog # ARY028)

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