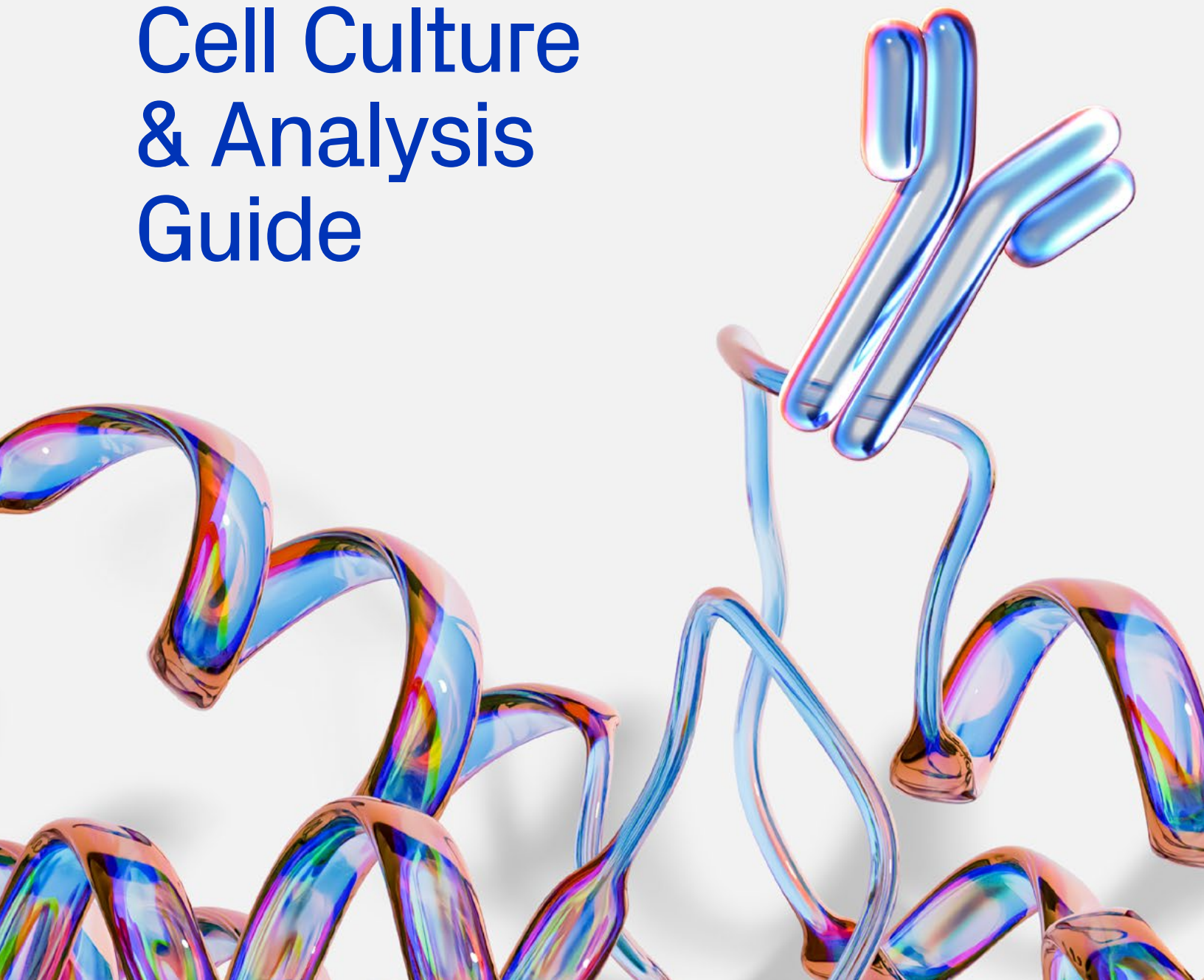


Immune Cell Culture & Analysis Guide



Immune Cell Catalog

R&D Systems™ Tools for Culture & Analysis

R&D Systems is focused on providing the highest quality reagents for culturing, activating, differentiating, and characterizing immune cells.

Immune cell culture and analysis are necessary for both basic research aimed at investigating the functions of different immune cell types and expanding and characterizing specific immune cell populations for therapeutic purposes.

For culturing and characterizing different immune cell types, we offer cell culture media, recombinant proteins, single and multianalyte immunoassays, and antibodies validated for a wide range of applications, including flow cytometry, immunohistochemistry, Western blot, and Simple Western. In addition to our reagents for basic research, we also offer anti-CD3 and anti-CD28 GMP antibodies, and both Animal free preclinical and GMP-grade proteins, which are manufactured using identical systems to ensure a seamless transition from preclinical research into clinical manufacturing. If you can't find the product that you need on our website, we also offer custom services including custom proteins, antibodies, ELISA assays, and Luminex® Panels precisely tailored to meet your experimental needs.

In this Guide:

- 03 ExCellerate™ Immune Cell Expansion Media
- 05 Proteins for Immune Cell Culture and Expansion: Research-grade, Animal-free, and GMP-grade
- 09 Antibodies for Immune Cell Activation or Differentiation
- 11 Immune Cell Characterization by Cytokine Secretion Analysis: Single-Analyte ELISA Kits
- 13 Simple Reader™ Compact ELISA Plate Reader
- 14 Multiplex Cytokine Analysis: Luminex® Assays
- 15 Antibodies for Immune Cell Marker Characterization



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Solutions for Immunology Research**

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IMMUNE CELL CULTURE

ExCellerate™ Immune Cell Expansion Media

Achieve more consistent cell culture performance and robust T cell, NK cell, or B cell expansion with our ExCellerate Media. These xeno-free media provide a step toward defined cell culture conditions, delivering high yields with minimal variability.

- Compatible with a variety of cell activation methods.
- Eliminate variability caused by trace animal components.
- Eliminate risk of contamination with mammalian pathogens.

TABLE // 01
ExCellerate Immune Cell Expansion Media

Product Name	Catalog #
ExCellerate B Cell Media, Xeno-Free	CCM031
ExCellerate Human NK Cell Expansion Media, Xeno-Free	CCM032
ExCellerate Human NK Cell Expansion Media, Animal Component-Free	CCM037
ExCellerate Human T Cell Expansion Media, Xeno-Free	CCM030



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IMMUNE CELL CULTURE

GMP Human T Cell Media

For the preclinical or clinical *ex vivo* culture of human T cells, try our GMP Human T Cell Media. This versatile, xeno-free media is compatible with various T cell activation methods, platforms (G-Rex and flasks) and different cytokine/growth factor combinations.

TABLE // 02
GMP Human T Cell Media

Product Name	Catalog #
GMP Human T Cell Media	CCM038-GMP



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FIGURE // 01
Expansion of Mouse B Cells

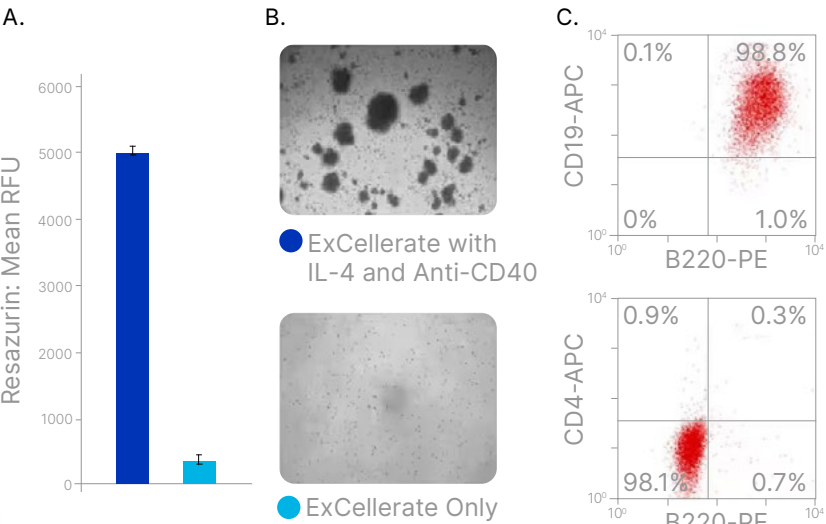


Figure 1. Expansion of Mouse B Cells with ExCellerate B Cell Expansion Media Supplemented with IL-4 and an Anti-Mouse CD40 Antibody. Mouse B cells were isolated from splenocytes using the MagCelect™ Mouse B Cell Isolation Kit (R&D Systems, Catalog # MAGM204) and expanded using ExCellerate B Cell Media (R&D Systems, Catalog # CCM031) with or without Recombinant Mouse IL-4 and a Rat Anti-Mouse CD40/TNFRSF5 Monoclonal Antibody (R&D Systems, Catalog # MAB440). (A) Expansion of mouse B cells was monitored using Resazurin (R&D Systems, Catalog # AR002). Data show that the ExCellerate B Cell Media supplemented with IL-4 and an Anti-Mouse CD40 Antibody results in robust mouse B cell expansion. (B) Representative brightfield images of mouse B cell colonies. (C) Expanded mouse B cells are B220⁺CD19⁺ (>98%) and negative for both CD3 and CD4.

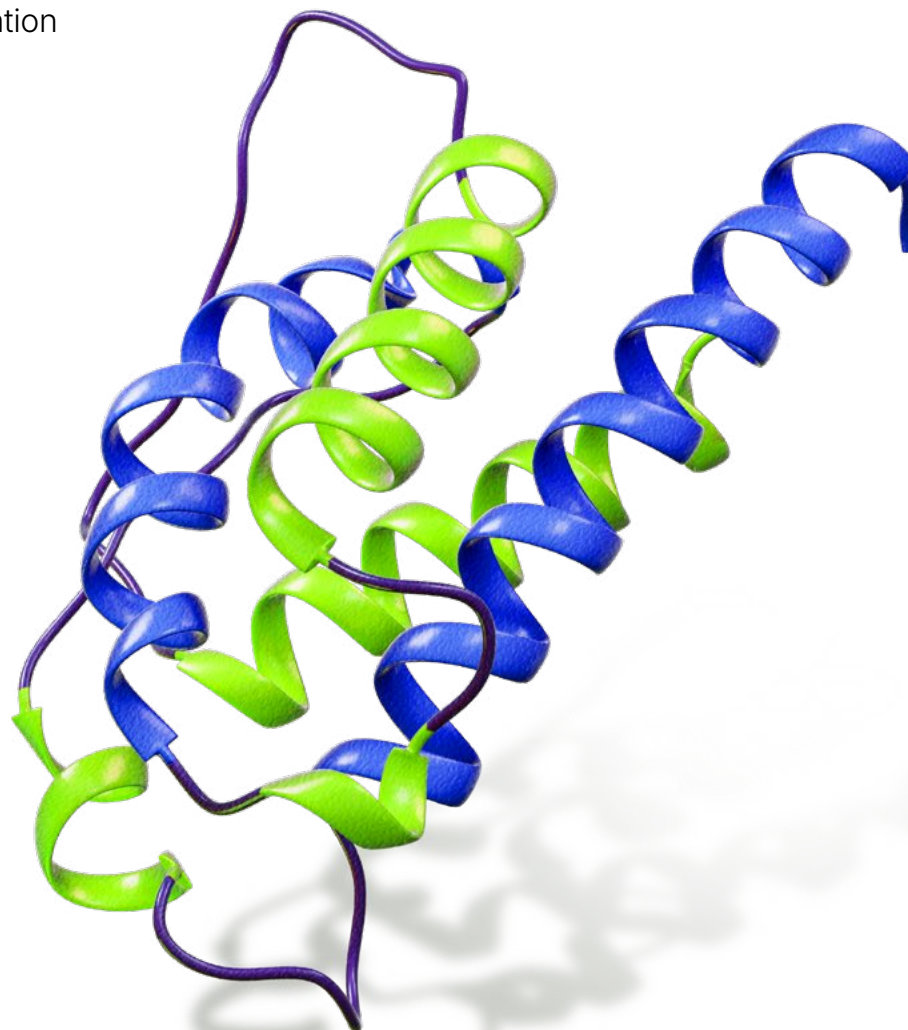
IMMUNE CELL CULTURE

Proteins for Immune Cell Culture and Expansion

Research-grade, Animal-free Preclinical, and GMP-grade

Optimize your immune cell cultures with R&D Systems cytokines. Our proteins provide superior performance and lot-to-lot consistency so you can have confidence in their ability to promote robust immune cell expansion and differentiation with minimal variability between cultures.

- Stringent quality control specifications for bioactivity, purity, and endotoxin.
- Lot-to-lot consistency ensured by testing each new lot side-by-side with previous lots.
- Large selection that includes over 5,000 research-grade, Animal-free preclinical, and GMP-grade proteins to meet all your research needs.



Browse Proteins for Immune Cell Culture

Scan the QR code or Visit
randsystems.com/immune-cell-culture

Animal-Free Preclinical Proteins and GMP-Grade Proteins

Animal-free Preclinical Proteins

In addition to our research-grade proteins, we also offer R&D Systems Animal-free Preclinical Proteins.

Animal-free Preclinical proteins are purified and manufactured in dedicated, controlled access, animal-free laboratories using equipment and media that are certified as animal-free, so that at no point in the production process are these proteins exposed to potential contamination by animal components or byproducts.

Additionally, our Animal-free Preclinical proteins are made in the same facility using the same processes as our Animal-free GMP-grade proteins. Since the proteins are the same, Animal-free Preclinical proteins make excellent reagents for research and process development and allow for a smooth transition from preclinical work to clinical manufacturing.

GMP-Grade Proteins for Cell Therapy Manufacturing

R&D Systems GMP-grade proteins are manufactured under guidelines that allow for their use as ancillary materials in cell therapy manufacturing processes.

GMP-grade proteins undergo extensive quality control testing and come with comprehensive documentation and full transparency and traceability of source and manufacturing system. This allows cell therapy manufacturers to be confident that they are using a consistent, safe, and traceable supply of reagents.

- **Documentation:** GMP products manufactured, tested, and released under an ISO 9001:2015 and ISO 13485:2016 certified quality management system, lot-to-lot consistency, materials traceability, employee training and 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 the World Health Organization:

1. USP Chapter <1043>, Ancillary Materials for Cell, Gene, and Tissue-Engineered Products.
2. Ph. Eur. General Chapter 5.2.12, Raw Materials of Biological Origin for the Production of Cell-based and Gene Therapy Medicinal Products.

- **Quality Control Testing:** Mass spectrometry, HPLC, SDS-PAGE, endotoxin, presence of host cell content, adventitious agents, and more.

- **Satisfied Clients:** Clients include more than 300 pharmaceutical and biotech companies, and we regularly welcome audits of our facilities.



Browse Animal-Free and GMP-grade Proteins

Scan the QR code or Visit
randsystems.com/animal-free-recombinant-proteins

CONTINUED →

TABLE // 03

Immune Cell Culture and Expansion:
Research-grade, Animal-free Preclinical, and GMP-grade Proteins

			Research-grade Protein	Animal-free Preclinical	Animal-free GMP-Grade Protein	
Molecule	Species	Source	Catalog #	Catalog #	Catalog #	Immune Cell Type(s)
BAFF/Blys/ TNFSF13B	Human	CHO	7537-BF			B cells
	Mouse	NS0	8876-BF			
CD40 Ligand/ TNFSF5	Human	<i>E. coli</i>	2706-CL			B cells
	Mouse	CHO	8230-CL			
Flt-3 Ligand	Human	<i>E. coli</i>	BT-FT3L	BT-FT3L-AFL	BT-FT3L-GMP*	Dendritic cells, Granulocytes
	Mouse	NS0	427-FL			
G-CSF	Human	<i>E. coli</i>	214-CS			Granulocytes
	Mouse	<i>E. coli</i>	414-CS			
GM-CSF	Human	<i>E. coli</i>	215-GM	AFL215	215-GMP	Dendritic cells, Macrophages
	Mouse	<i>E. coli</i>	415-ML			
ICOS Ligand/ B7-H2	Human	NS0	165-B7			Tfh cells
	Mouse	NS0	158-B7			
IFN-γ	Human	<i>E. coli</i>	285-IF	AFL285	285-GMP*	B cells, Macrophages, Th1 cells
	Mouse	<i>E. coli</i>	485-MI			
IL-1β	Human	<i>E. coli</i>	201-LB	AFL201	201-GMP	Th17 cells
	Mouse	<i>E. coli</i>	401-ML			
IL-2	Human	<i>E. coli</i>	BT-002	BT-002-AFL•	BT-002-GMP•*	B cells, NK cells, T cells, Tregs
	Mouse	<i>E. coli</i>	402-ML			
IL-3	Human	<i>E. coli</i>	203-IL	AFL203	203-GMP	Dendritic cells, Granulocytes
	Mouse	<i>E. coli</i>	403-ML			
IL-4	Human	<i>E. coli</i>	BT-004	BT-004-AFL	BT-004-GMP*	B cells, Dendritic cells, Macrophages, Th2 cells, Th9 cells
	Mouse	<i>E. coli</i>	404-ML			
IL-6	Human	<i>E. coli</i>	206-IL	AFL206	206-GMP*	Dendritic cells, Granulocytes, Th17 cells, Th22 cells, Tfh cells
	Mouse	<i>E. coli</i>	406-ML			
IL-7	Human	<i>E. coli</i>	BT-007	BT-007-AFL•	BT-007-GMP•*	T cells, Th2 cells
	Mouse	<i>E. coli</i>	407-ML			
IL-10	Human	<i>E. coli</i>	1064-ILB	AFL1064	1064-GMP*	B cells
	Mouse	<i>E. coli</i>	417-ML			
IL-12	Human	HEK293	10018-IL			NK cells, Th1 cells, Tfh cells
	Mouse	Sf21 (baculovirus)	419-ML			
IL-13	Human	<i>E. coli</i>	213-ILB			Macrophages
	Mouse	<i>E. coli</i>	413-ML			
IL-15	Human	<i>E. coli</i>	BT-015	BT-015-AFL•	BT-015-GMP•*	NK cells, T cells
	Mouse	<i>E. coli</i>	447-ML			
IL-18/IL-1F4	Human	<i>E. coli</i>	9124-IL			NK cells, Th1 cells
	Mouse	<i>E. coli</i>	9139-IL			

			Research-grade Protein	Animal-free Preclinical	Animal-free GMP-Grade Protein	
Molecule	Species	Source	Catalog #	Catalog #	Catalog #	Immune Cell Type(s)
IL-21	Human	<i>E. coli</i>	8879-IL	BT-021-AFL•	BT-021-GMP•	B cells, NK cells, Th17 cells, Tfh cells
	Mouse	<i>E. coli</i>	594-ML			
IL-23	Human	Sf21 (baculovirus)	1290-IL			Th17 cells, Tfh cells
	Mouse	HEK293	11269-ML			
IL-27	Human	NS0	2526-IL			Th1 cells
	Mouse	NS0	2799-ML			
M-CSF	Human	<i>E. coli</i>	216-MC	AFL216	216-GMP	Dendritic cells, Macrophages
	Mouse	<i>E. coli</i>	416-ML			
SCF/c-kit Ligand	Human	<i>E. coli</i>	BT-SCF	BT-SCF-AFL	BT-SCF-GMP*	Granulocytes
	Mouse	<i>E. coli</i>	455-MC			
TGF-β1	Human	HEK293	7754-BH			Th9 cells, Th17 cells, Tfh cells, Tregs
	Mouse	CHO	7666-MB			
Thrombopoietin	Human	<i>E. coli</i>	BT-TPO	BT-TPO-AFL	BT-TPO-GMP+	Dendritic cells
	Mouse	NS0	488-TO			
TNF-α	Human	<i>E. coli</i>	210-TA	AFL210	210-GMP	Dendritic cells, Macrophages, Th22 cells
	Mouse	<i>E. coli</i>	410-MT			
TSLP	Human	<i>E. coli</i>	1398-TS			Th2 cells
	Mouse	NS0	555-TS			

- Liquid formulations for these GMP and Animal-free preclinical proteins are now available.
- DMF have been filed for these GMP proteins.
- * ProPak Closed GMP System and G-Rex are available through our joint venture partnership with ScaleReady. G-Rex® is a registered trademark of Wilson Wolf Corporation.

FIGURE // 02

Differentiation and Characterization of M1 and M2 Macrophages

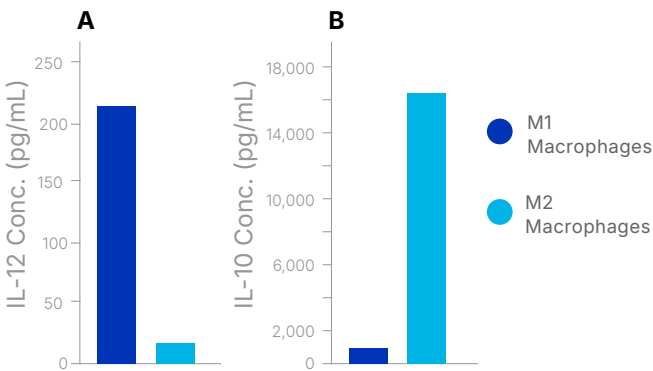


Figure 2. Differentiation and Characterization of M1 and M2 Macrophages. Enriched human CD14+ monocytes were cultured in the presence of either **Recombinant Human GM-CSF** (R&D Systems, Catalog # 215-GM) or **Recombinant Human M-CSF** (R&D Systems, Catalog # 216-MC) for 6 days in serum-free base media to promote the differentiation of M1 or M2 macrophages, respectively. On day 6 of the differentiation, M1 and M2 macrophages were stimulated with 1 ug/mL LPS for 24 hours. Cell culture supernatants were collected and cytokine secretion was measured using (A) the **Human IL-12 p70 Quantikine™ HS ELISA Kit** (R&D Systems, Catalog # HS120) and (B) the **Human IL-10 Quantikine™ ELISA Kit** (R&D Systems, Catalog # D1000B).

Antibodies for Immune Cell Activation or Differentiation

Utilize research use only or GMP antibodies from our R&D Systems™ or Novus Biologicals™ brands for immune cell activation or differentiation. From anti-CD3 and CD28 antibodies to anti-IFN-γ, IL-4, and IL-12 antibodies, we have the reagents you need for your cell culture experiments. Additionally, we offer over 1,400 antibodies validated for blocking/neutralization that can be used in cell culture to investigate different protein functions.

- Extensive in-house validation and expert product support to ensure performance.
- Data images, citations, reviews, and a 100% satisfaction guarantee enable customers to have confidence that our antibodies will work in the applications and species designated.
- Our antibodies are manufactured to ensure low endotoxin levels.



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randsystems.com/antibodies

TABLE // 04
Antibodies for Immune Cell Culture or Differentiation

Molecule	Species	Clone	Catalog #	Antibody Applications
CD3	Human	UCHT1*	MAB100	FA, FC, ICC/IF, IP
	Mouse	145-2C11•	MAB484	CyTOF-reported, Depl., FA, FC, IP
	Mouse	17-A2	MAB4841	CyTOF-ready, FA, FC, ICC/IF, IP
CD28	Human	37407	MAB342	FA, ICC/IF, WB
	Human	Polyclonal	AF-342-PB	CyTOF-ready, FA, FC, ICC/IF
	Mouse	794716	MAB4832	CyTOF-ready, FA, FC
CD40	Human	82111	MAB6321	AgAct, CyTOF-ready, FC, ICC
	Human/Mouse	5C3*	NBP1-43416	FC, ICC/IF, IHC
	Human/Mouse	3G8*	NBP3-21452	B/N, FC, ICC/IF, IHC, IP

Molecule	Species	Clone	Catalog #	Antibody Applications
IFN-γ	Human	25718	MAB285	B/N, FC, ICC/IF
	Human	Polyclonal	AF-285-NA	B/N, ICC/IF, WB
	Mouse	37895	MAB485	B/N, CyTOF-ready, FC, WB
	Mouse	H22•	MAB4851	B/N, ICC/IF
	Mouse	Polyclonal	AF-485-NA	B/N, WB
IL-4	Human	34019	MAB204	B/N, WB
	Human	Polyclonal	AF-204-NA	B/N, WB
	Mouse	30340	MAB404	B/N, Ecap, WB
	Mouse	Polyclonal	AF-404-NA	B/N, WB
IL-12	Human	24910	MAB219	B/N, IHC, WB
	Human	Polyclonal	AF-219-NA	B/N, ICC/IF, WB
	Mouse	Polyclonal	AF-419-NA	B/N, WB
NKp30	Human	210845*	MAB1849	AgAct, CyTOF-ready, FC
NKp46	Human	195314*	MAB1850	AgAct, CyTOF-reported, FC, ICC, IHC, WB
	Mouse	Polyclonal	AF2225	AgAct, CyTOF-ready, FC, IHC, WB

- Indicates this antibody is either a recombinant monoclonal antibody or is available as one.
- * Clone was used by HLDA to establish CD designation.

Antibody Application Key

AgAct: Agonist Activity

B/N: Blocking/Neutralization

CyTOF-ready: Mass Cytometry

CyTOF-reported: Mass Cytometry

Depl : Cell Depletion

Ecap : ELISA Capture

FA : Functional Assay

FC : Flow Cytometry

ICC/IF : Immunocytochemistry/Immunofluorescence

IHC : Immunohistochemistry

IP : Immunoprecipitation

WB : Western Blot

R&D Systems Products

Control Variables & SAVE with Bulk Reagents

Receive competitive discounts on bulk quantities of a single item or multiple items in one order including: **Proteins, Antibodies, Small Molecules, ELISAs**

- **Cost Savings:** As the quantity of the item(s) in your order increases, the price decreases.
- **Curated Selection:** More than 5,000 recombinant proteins, 425,000 R&D Systems™ and Novus Biologicals™ antibodies, 1,600 ELISA products, and 3,500 Tocris™ small molecules are available.
- **Supply Chain Reliability:** Our manufacturing expertise ensures that we can provide you with a stable supply of the reagents you need.



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IMMUNE CELL ANALYSIS

Immune Cell Characterization by Cytokine Secretion Analysis

Different immune cell types and cell type-specific subsets are often characterized based on their cytokine secretion profiles. R&D Systems offers a broad range of immunoassays for quantifying soluble proteins.

This includes R&D Systems complete, ready-to-use Quantikine™ ELISAs, our 90-minute QuickKit™ ELISAs, and the more versatile DuoSet™ ELISA Development Systems that provide all the components necessary for a customer to develop their own working assay. Our immunoassays are vertically integrated, meaning our proteins, antibodies, and diluents are manufactured in-house, allowing us to maintain complete control over the quality of our products and ensure long-term supply stability.



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Quantikine ELISA Kits

- Extensively tested for long-term consistency and reproducibility
- Fully validated sample types
- Optimized reagents and diluents for accurate and sensitive sample values

Quantikine QuickKit ELISAs

- Data generated in 90 minutes
- Quantikine quality with lot-to-lot consistency and reproducibility
- Simplified protocol — only one wash step

DuoSet ELISA Development Reagents

- Carefully selected and validated matched antibody pairs for optimal performance
- Large menu — over 1,000 targets with novel targets across multiple species
- Adaptable for use across multiple platforms and 384 well



TABLE // 05
Select Single Analyte ELISA Kits for Characterizing Immune Cell Types

Analyte	Species	Quantikine Kit	DuoSet ELISA Development System
		Catalog #	Catalog #
GM-CSF	Human*	DGM00	DY215
	Mouse	MGM00	DY415
IFN-γ	Human**	DIF50C	DY285B
	Mouse	MIF00	DY485
IL-1β	Human**	DLB50	DY201
	Mouse*	MLB00C	DY401
IL-2	Human**	D2050	DY202
	Mouse	M2000	DY402
IL-4	Human*	D4050	DY204
	Mouse	M4000B	DY404
IL-5	Human	D5000B	DY205
	Mouse	M5000	DY405
IL-6	Human**	D6050B	DY206
	Mouse	M6000B	DY406
IL-9	Human		DY209
	Mouse		DY409
IL-10	Human*	D1000B	DY217B
	Mouse	M1000B	DY417
IL-12/IL-23 p40	Human	DP400	DY1240
	Mouse	M1240 (Allele-specific)	DY499
	Mouse	MP400 (Non-Allele-specific)	DY2398
IL-12 p70	Human*	D1200	DY1270
	Mouse	M1270	DY419
IL-13	Human	D1300B	DY213
	Mouse	M1300CB (Culture media)	DY413
IL-17/IL-17A	Human**	D1700	DY317
	Mouse*	M1700	DY421
IL-17A/F	Human		DY5194
	Mouse	M17AF0	DY5390
IL-17E/IL-25	Human		DY1258
	Mouse		DY1399

Analyte	Species	Quantikine Kit	DuoSet ELISA Development System
		Catalog #	Catalog #
IL-17F	Human		DY1335B
	Mouse	M17F0	DY2057
IL-21	Human		DY8879
	Mouse		DY594
IL-22	Human	D2200	DY782
	Mouse	M2200	DY582
IL-23	Human	D2300B	DY1290
	Mouse	M2300	DY1887
TGF-β1	Human	DB100C	DY240
	Mouse	DB100C	DY1679
TNF-α	Human**	DTA00D	DY210
	Mouse*	MTA00B	DY410

* Quantikine High Sensitivity ELISA Kits are also available for these analytes and species.
* QuickKit ELISAs are also available for these analytes and species.



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Simple Reader™ Compact ELISA Plate Reader

Empower every lab member with their own compact, reliable microplate reader featuring 96 individual detection units and seamless plug-and-play functionality, perfect for any location.

- 4 LED Light Sources: 450 nm, 490 nm, 540 nm, 595 nm.
- 90 Detection Units: Consistent and robust results.
- Fast Read Time: Analyze data quickly with under 5 seconds per plate read.



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Ella™ Automated ELISA Platform

Boost your productivity with Ella, an automated benchtop ELISA platform designed to deliver accurate, reproducible data with no manual steps. Simple Plex™ assays run on the Ella platform are fully validated, highly sensitive, and can quantify up to 8 analytes simultaneously in less than 90 minutes.

- Superior precision and reproducibility with results in less than 90 minutes
- Fully validated, sub-picograms sensitivity with up to 4 logs of dynamic range
- Choose from 350+ targets spanning human, mouse, rat, and non-human primate species



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IMMUNE CELL ANALYSIS

R&D Systems Luminex® Panels

Luminex Panels are bead-based multiplex assays that enable you to multiplex up to 50 analytes, conserving on sample, time, and cost.

Select from more than 490 targets spanning human, mouse, rat, porcine, and non-human primate species. Luminex Assays will deliver data that is reliable and reproducible because every panel is QC tested.

Luminex Assays are available in 3 flexible formats:

1. **Discovery Assays:** Mix and match analyte customization.
2. **Fixed High Performance Panels:** Fully stocked and ready to ship.
3. **Configurable High Performance Panels:** Choose from a selection of the analytes or the entire panel.



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R&D Systems Services

Custom Services

When your work demands unique reagents or scientific support, turn to the product development experts behind R&D Systems' trusted products. Together with a dedicated project manager, our scientists, quality assurance team, and world-class technical support will deliver custom proteins, antibodies, ELISA Kits, or Luminex® Panels precisely tailored to meet your experimental needs.

- Common services include proteins, antibodies, or ELISAs assays made from scratch, unique conjugations, specific buffer formulations, and custom bottling or pack sizes.
- Custom reagents provide specificity, long-term consistency, and a guaranteed supply, while saving you development time.
- Custom reagents can be produced in large quantities with regulatory support.



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Immune Cell Marker Characterization



Explore Tools for Flow Cytometry
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In addition to characterizing immune cells based on their cytokine secretion profiles, different cell types and cell type-specific subsets can also be characterized based on the expression of cell surface and intracellular markers.

Choose from thousands of antibodies qualified for immunocytochemistry, flow cytometry, immunohistochemistry, Western blot, and Simple Western™. Our catalog of antibodies has been validated for specificity and reproducibility in over 25 species for more than 15 applications, ensuring you will find one for your research needs.

Hundreds of unique, world-renowned clones, many of which have been used to establish CD nomenclature through HLDA workshops, are available from the R&D Systems brand, while the Novus Biologicals brand provides an expansive collection of both proprietary antibodies and some of the most highly referenced antibody clones on market.

FIGURE // 03
10-Parameter Flow Cytometric Analysis of Immune Cells in Human Whole Blood

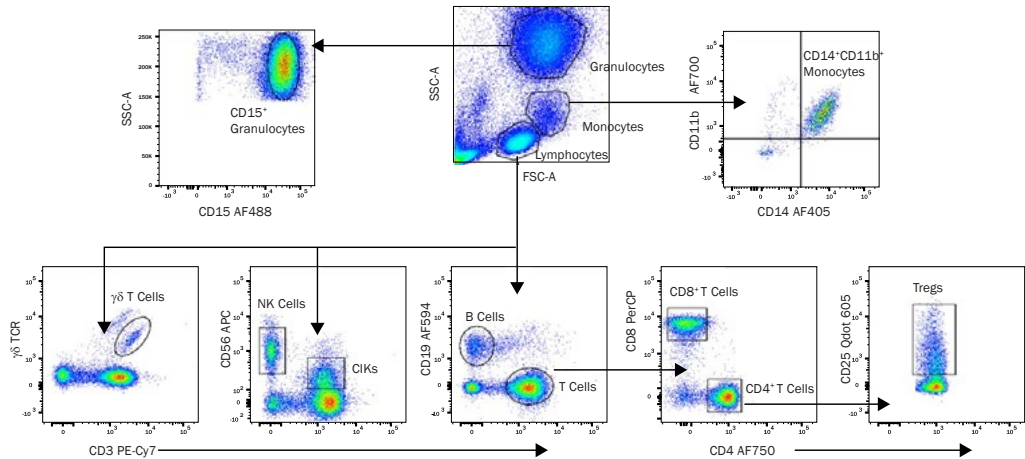


Figure 3. 10-Parameter Flow Cytometric Analysis of Immune Cells in Human Whole Blood. Human whole blood was stained with the following panel of monoclonal antibodies: **Alexa Fluor® 700-conjugated Mouse Anti-Human CD11b/Integrin αM** (R&D Systems, Catalog # FAB1699N), **Alexa Fluor405-conjugated Mouse Anti-Human CD14** (R&D Systems, Catalog FAB3832V), **Alexa Fluor 488-conjugated Mouse Anti-Human CD15/Lewis X** (R&D Systems, Catalog # FAB7368G), **PE-Cy7-conjugated Mouse Anti-Human CD3** (Novus Biologicals, Catalog # NB100-2726PECy7), **Alexa Fluor 705-conjugated Mouse Anti-Human CD4** (R&D Systems, Catalog # FAB3791S), **PerCP-conjugated Mouse Anti-Human CD8α** (R&D Systems, Catalog # FAB1509C), **Alexa Fluor 594-conjugated Mouse Anti-Human CD19** (R&D Systems, Catalog # FAB4867T), **AmCyan-conjugated Anti-Human γδTCR**, **BV605-conjugated Anti-Human CD25/IL-2 Rα**, and **APC-conjugated Mouse Anti-Human CD56/NCAM-1** (R&D Systems, Catalog # FAB2408A). Different immune cell populations identified by the specific staining shown in each dot plot were gated and labeled or further stained as indicated to identify subsets of that particular cell type. *Alexa Fluor® is a registered trademark of Molecular Probes, Inc., Eugene, OR.*

Fluorescent Conjugate Options

Explore our selection of 28 fluorescent labels for flow cytometry, including our series of Alexa Fluor® and DyLight® dyes that span the spectrum from the near-UV to the near-IR. This broad selection, coupled with our extensive range of flow cytometry-validated antibodies against common and unique targets, makes it easier than ever to find the exact antibody-fluorochrome combinations you need and provides the highest levels of flexibility for multicolor panel design. Our selection of R&D Systems fluorochrome-conjugated antibodies are available at rndsystems.com and Novus Biologicals conjugated antibodies are available at novusbio.com.

- Step 1.** Search your target and filter for flow cytometry-validated antibodies.
Step 2. Select your antibody of interest and the conjugate option from the drop-down menu.
Step 3. Receive your conjugated antibody in 5-7 business days.

TABLE // 06
Fluorescent Label Options for Flow Cytometry

Excitation Laser (nm)	Conjugate	Excitation Max (nm)	Emission Max (nm)	Emission Color
UV (350)	Alexa Fluor® 350	346	442	
UV (350)	DyLight® 350	353	432	
Violet (405)	DyLight® 405	400	420	
Violet (405)	Alexa Fluor® 405	401	421	
Violet (405)	mFluor™ Violet 450	406	445	
Violet (405)	mFluor™ Violet 500	410	501	
Violet (405)	mFluor™ Violet 610	421	613	
Blue (488)	PerCP	482	678	
Blue (488)	Y-G (561) PE/Cy7	489, 566	782	
Blue (488)	Alexa Fluor® 488	490	525	
Blue (488)	DyLight® 488	493	518	
Blue (488)	FITC	498	519	
Blue (488)	Y-G (561) PE	498, 565	578	
Blue (488)	Y-G (561) PE/Atto594	498,566	632	
Blue (488)	Y-G (561) PE/Cy5.5	498, 566	700	
Y-G (561)	Alexa Fluor® 532	532	554	
Y-G (561)	Janelia Fluor® 549	549	571	
Y-G (561)	DyLight® 550	562	576	
Y-G (561)	Alexa Fluor® 594	590	617	
Y-G (561)	DyLight® 594	593	618	
Red (633,640)	Janelia Fluor® 646	646	664	
Red (633,640)	APC	650	660	
Red (633,640)	DyLight® 650	652	672	
Red (633,640)	Alexa Fluor® 647	653	669	
Red (633,640)	DyLight® 680	692	712	
Red (633,640)	Alexa Fluor® 700	696	720	
Red (633,640)	Alexa Fluor® 750	749	775	
Red (633, 640)	APC/Cy7	652	790	

Key: Y-G= Yellow-Green

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DyLight® is a registered trademark of Thermo Fisher Scientific, Inc. and its subsidiaries.
Janelia Fluor® is a registered trademark of the Howard Hughes Medical Institute.
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TABLE // 07

Select Flow Cytometry Antibodies for Identifying Cell Surface Markers on Human & Mouse Immune Cells

Unconjugated Ab				
Molecule	Species	Clone	Catalog #	Immune Cell Type(s)
BCMA	Human	1042037	MAB107621	B cells
	Mouse	161616	MAB593	
CCR2	Human	48607*	MAB150	Monocytes
	Mouse	475301	MAB55381	
CCR3	Human	61828*	MAB155	Eosinophils, Th2 cells
	Mouse	83101	MAB729	
CCR4	Human	205410*•	MAB1567	Th2 cells, Th17 cells
CCR5	Human	45531	MAB1802	Th1 cells, Monocytes
	Mouse	225307	MAB18041	
CCR6	Human	53103*•	MAB195	ILC3 cells, Th9 cells, Th17 cells
	Mouse	140706•	MAB590	
CCR7	Human	150503*•	MAB197	Dendritic cells, MoDCs, T cells
	Mouse	4B12	MAB3477	
CCR10	Human	314305•	MAB3478	Th22 cells
	Mouse	248918R•	MAB2815R	
CD1a	Human	O10*	NBP2-34697	Dendritic cells, MoDCs
CD1c/BDCA-1	Human	L161*	NBP2-62220	Dendritic cells, MoDCs
CD3	Human	UCHT1*•	MAB100	NKT cells, T cells
	Mouse	145-2C11	MAB484	
CD4	Human	RPA-T4*	MAB37912	T cells
	Mouse	GK1.5	MAB554	
CD8α	Human	RPA-T8*	MAB3802	T cells
	Mouse	53-6.7	MAB116	
CD11b/Integrin αM	Human	ICRF44	MAB1699	Dendritic cells, Granulocytes, Macrophages, Monocytes
	Mouse	M1/70	MAB1124	
CD11c	Human	3.9*	NB100-2711	Dendritic cells, Monocytes, MoDCs
	Mouse	N418	MAB69501	
CD14	Human	M5E2*	NB100-77758	Monocytes, MoDCs
	Mouse	503•	NBP2-90362	
CD15	Human	ICRF29-2	MAB7368	Neutrophils
CD16/Fcγ RIII	Human	3G8*•	NBP3-21452	Monocytes, Neutrophils, NK cells
CD19	Human/Mouse	1D3	NBP2-24965	B cells
CD23/Fcε RII	Mouse	007•	NBP2-90682	Mast cells
CD24	Human	ML5	MAB5247	B cells
CD25/IL-2 Rα	Human	216•	NBP2-89307	ILC2 cells, T cells, Tregs
	Mouse	PC61.5.3	MAB9164	
CD27/TNFRSF7	Human	O323*	NBP1-43426	B cells, T cells
	Mouse	012•	NBP2-90423	
CD28	Human	CD28.2*	NBP1-79126	T cells
CD38	Human	AT1	NBP2-47908	B cells
CD44	Mouse	IM7	NBP1-41266	T cells
CD45	Human/Mouse	30-F11	NB100-77417	Leukocytes

* Clone was used by HLDA to establish CD designation.

• Indicates this antibody is either a recombinant monoclonal antibody or is available as one.

Unconjugated Ab				
Molecule	Species	Clone	Catalog #	Immune Cell Type(s)
CD45RA	Human	MEM-56*	NB500-329	Naïve T cells
CD45RO	Human	UCHL1	MAB10642	Memory T cells
CD56/NCAM-1	Human	735•	NBP2-52669	NK cells, NKT cells
CD62L/L-Selectin	Human	DREG56*	NBP1-42795	T cells
	Mouse	MEL-14•	NBP2-81083	
CD63	Human	H5C6*	NBP2-42225	Basophils, mast cells
CD66b/CEACAM-8	Human	6/40c	NBP2-54627	Neutrophils
CD68/SR-D1	Human	ED1	NB600-985	Macrophages
CD69	Human	FN50*	NBP1-43387	NK cells, T cells
	Mouse	H1.2F3	NBP1-28011	
CD80/B7-1	Human/Mouse	16-10A1	NBP1-43385	Macrophages
CD83	Mouse	101•	NBP3-12771	Dendritic cells
CD86/B7-2	Human/Mouse	BU63*	NBP2-34569	Macrophages
CD90/Thy1	Mouse	OX-7	NB100-65543	ILCs
CD103/Integrin αE	Mouse	Polyclonal	AF1990	Dendritic cells
CD115/M-CSF R	Human	12-3A3-1B10*	NBP1-43362	Monocytes
CD117/c-kit	Human	YB5.B8*	NBP1-43358	Basophils, ILC2 cells, ILC3 cells, Mast cells
	Human/Mouse	ACK2	NBP1-43359	
CD123/IL-3 Rα	Human	6H6	NB600-1185	Basophils, Dendritic cells
CD127/IL-7 Rα	Human	40131	MAB306	ILCs
	Mouse	1140A•	MAB7473	
CD138/Syndecan-1	Human	017•	NBP2-89899	B cells
	Mouse	300506	MAB2966	
CD141/BDCA-3	Human	501733	MAB3947	Dendritic cells
CD163	Human	GHI/61*	NBP1-43341	Macrophages
CD172/SIRPα	Human	602411	MAB4546	Dendritic cells
	Mouse	001•	NBP2-90751	
CD206/MMR	Human	685641	MAB25342	Macrophages, MoDCs
	Mouse	857615	MAB25351	
CD317/BST-2	Mouse	44E9R•	MAB8660	Dendritic cells
CLEC9a	Human	683409*	MAB6049	Dendritic cells
	Mouse	1F6	NBP3-08840	
CRTH-2	Human	30110	MAB33381	ILC2 cells
CX3CR1	Human/Mouse	Polyclonal	AF5825	Dendritic cells, Monocytes
CXCR3	Human	49801•	MAB160	ILC1 cells, Th1 cells
	Mouse	220803	MAB1685	
CXCR4	Human	12G5	MAB170	Th2 cells
	Mouse	247506	MAB21651	
CXCR5	Human	51505*	MAB190	Tfh cells
	Mouse	614641	MAB6198	

* Clone was used by HLDA to establish CD designation.

• Indicates this antibody is either a recombinant monoclonal antibody or is available as one.

TABLE // 07

Select Flow Cytometry Antibodies for Identifying Cell Surface Markers on Human & Mouse Immune Cells *(continued)*

Unconjugated Ab				
Molecule	Species	Clone	Catalog #	Immune Cell Type(s)
ENPP-3/CD203c	Human	NP4D6	MAB5756	Basophils
F4/80	Mouse	Cl:A3-1•	NBP2-81029	Eosinophils, Macrophages, Neutrophils
Fcε RIα	Human	773735	MAB66781	Basophils, Mast cells
	Mouse	43160	NBP1-43279	
Gr-1/Ly-6G	Mouse	1A8	MAB10371	Neutrophils
HLA-DR	Human	L203	MAB4869	Dendritic cells, Macrophages, Monocytes, MoDCs
ICOS	Human	ISA-3	NBP1-43126	ILC2 cells, Tfh cells
	Mouse	2317C•	MAB1682	
IgD	Human	IA6-2	MAB9857	B cells
	Mouse	11-26C	MAB9858	
IgM	Human	DA4-4	NBP2-34252	B cells
	Mouse	II/41	NBP1-43303	
IL-23 R	Human	218213	MAB14001	ILC3 cells
MHC class II	Mouse	M5/114	NBP2-21789	Dendritic cells, Macrophages, Monocytes, MoDCs
NK1.1/CD161	Mouse	PK136	MAB76141	ILC1 cells, NK cells, NKT cells
Neuropilin-1/BDCA-4	Human	446921	MAB3870	Dendritic cells
NKp44	Human	253415	MAB22491	ILC3 cells
NKp46	Mouse	29A1.4	MAB22252	ILC1 cells, ILC3 cells, NK cells
Sca-1/Ly6	Mouse	177228	MAB1226	ILC2 cells
Siglec-8	Human	837535	MAB7975	Eosinophils
ST2/IL-33 R	Human	Polyclonal	MAB5231	ILC2 cells, Th2 cells
	Mouse	245707	MAB10041	
XCR1	Human	1097A•	MAB8571	Dendritic cells

- * Clone was used by HLDA to establish CD designation.
- Indicates this antibody is either a recombinant monoclonal antibody or is available as one.

TABLE // 08

Flow Cytometry Antibodies for Identifying Immune Cell Transcription Factors

Unconjugated Ab				
Molecule	Species	Clone	Catalog #	Immune Cell Type(s)
AHR	Human/Mouse	RPT9	NB300-515	Th22 cells
Bcl-6	Human/Mouse	SPM602	NBP3-08851	Tfh cells
FoxP3	Human/Mouse	1054C•	MAB8214	Tregs
GATA-3	Human/Mouse	OT18H4	NBP2-70796	ILC2 cells, Th2 cells
PU.1	Human	732322	MAB5870	Th9 cells
RORγt	Human	1181A	MAB61093	ILC3 cells, Th17 cells
T-bet	Human/Mouse	4B10	NBP1-43298	ILC1 cells, NK cells, Th1 cells

- Antibody is a recombinant monoclonal antibody.

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