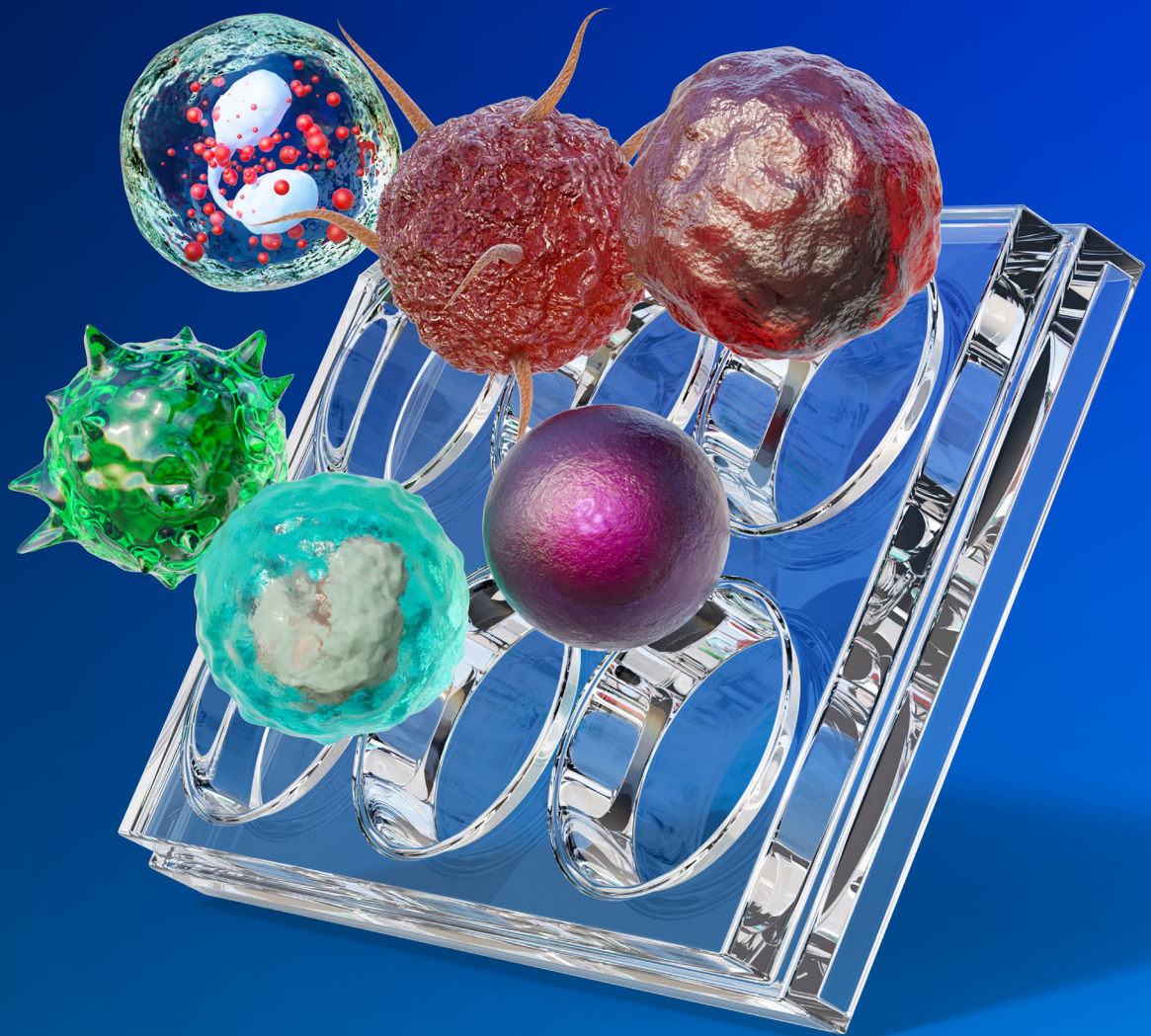


biotechne®

Immunology Research
Immune Cell Isolation and Culture

Immune Cell Isolation and Culture



Immune Cell Catalog

Bio-Techne Tools for Isolation and Culture



Learn about the Bio-Techne Solutions for Immunology Research

Scan the QR Code or Visit: bio-techne.com/research-areas/immunology

Bio-Techne is focused on providing the highest quality reagents for isolating, activating, differentiating, and culturing immune cells.

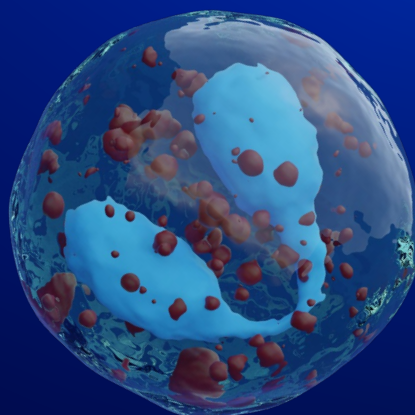
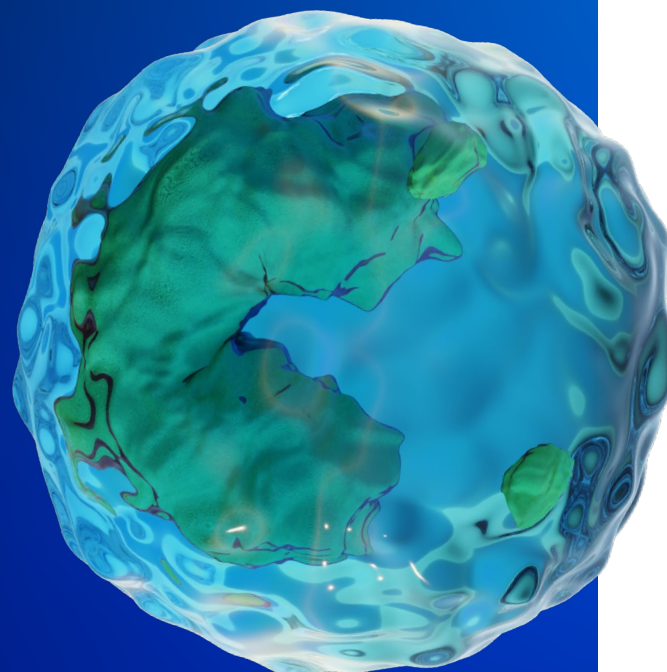
Immune cell isolation and culture are necessary for both basic research aimed at investigating the functions of different immune cell types and expanding specific immune cell populations for therapeutic purposes.

From natural killer (NK) cells and macrophages to dendritic cells and T cells, we offer kits for cell enrichment, cell culture media, fetal bovine serum, and an unparalleled selection of bioactive recombinant proteins and antibodies.

In addition to our reagents for basic research, we also offer Animal-free preclinical proteins and GMP proteins, which are manufactured using the same systems to ensure a seamless transition from preclinical research into clinical manufacturing.

In This Guide:

Pala™ Cell Sorter and Single Cell Dispenser	03
MagCelect™ Cell Selection Kits & Reagents	04
CellXVivo™ Kits for Immune Cell Differentiation or Expansion	05
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Pala

Cell Sorter and Single Cell Dispenser



Meet Pala

Scan the QR Code or Visit: bio-techne.com/pala

Whether you are cloning transfected single cells, isolating a specific cell population, or finding rare immune cells, the compact and incredibly simple to use Pala single cell dispenser allows you to gently sort single cells or target cell populations in any lab.



Pala Advantages:

- Fast single cell dispensing: 96-well plate in 1 minute
- Gentle sorting at < 2 psi preserves cell integrity
- Rare cell enrichment and bulk sorting capabilities enable versatile applications
- Fully automated and zero maintenance, no calibration needed and no clogging
- Compact benchtop size, lightweight and portable; fits inside a cell culture hood

TABLE // 01

Pala Single Cell Dispenser vs Traditional Cell Sorters

Feature	Pala Single Cell Dispensers	Traditional Cell Dispensers
Pressure	< 2 psi	20 - 70 psi
Initiation time	2 - 3 min	30 - 45 min
Processing speed	2 - 50,000 cells/sec	2,000 - 20,000 cells/sec
Fluorescence channels	Up to 11	16
Minimum input	100 cells	200,000 cells
Droplet size	1 µL	0.001 - 0.005 µL
Sheath	6.5 mL/hr	1 - 2 L/hr
Sterile sorting	Easy	Difficult
96-well sorting	Standard	Optional
System clogging	No	Yes
Cost	\$	\$\$\$

MagCollect™

Cell Selection Kits & Reagents



Browse All MagCollect Kits

Scan the QR Code or Visit:

bio-techne.com/magcollect-kits

Isolation or enrichment of a specific cell type of interest from a heterogeneous cell population is frequently a critical first step in immunology research for obtaining a pure population of cells for further characterization.

R&D Systems™ MagCollect™ Cell Selection Kits are designed to enrich for specific cell populations based on either a negative or positive selection principle.

Features of the kits include:

- Beads with a high binding capacity
- Small beads in ferrofluid that have no magnetic memory and will not induce cell damage
- Allow cells to be separated to a very high purity in minutes

FIGURE // 01

Isolation of Human CD19+ B Cells from PBMCs by MagCollect Human B Cell Isolation Kit

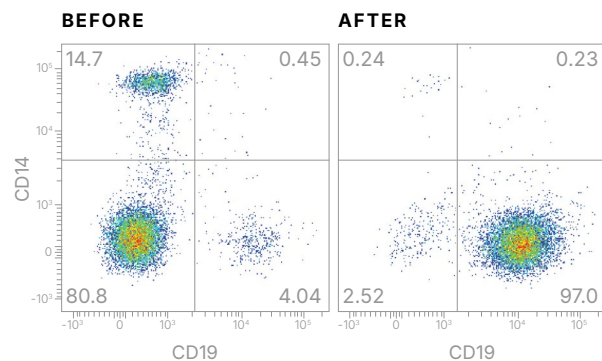


Figure 01. Human PBMCs were prepared as described in the cell preparation section of the [MagCollect Human B Cell Isolation Kit](#) (R&D Systems, Catalog # MAGH103). Cells were stained both before and after B cell isolation with the MagCollect Kit using a [PE-conjugated Mouse Anti-Human CD19 Monoclonal Antibody](#) (R&D Systems, Catalog # FAB4867P) and an [APC-conjugated Mouse Anti-Human CD14 Monoclonal Antibody](#) (R&D Systems, Catalog # FAB3832A).

TABLE // 02

MagCollect Cell Isolation Kits

Product Name	Catalog #
Human B Cell Isolation Kit	MAGH103
Human CD14 ⁺ Cell Isolation Kit	MAGH105
Human CD3 ⁺ T Cell Isolation Kit	MAGH101
Human Naïve CD4 ⁺ T Cell Isolation Kit	MAGH115
Human CD4 ⁺ T Cell Isolation Kit	MAGH102
Human Memory CD4 ⁺ T Cell Isolation Kit	MAGH116
Human CD4 ⁺ CD25 ⁺ Regulatory T Cell Isolation Kit	MAGH104
Human CD8 ⁺ T Cell Isolation Kit	MAGH112
Human Natural Killer Cell Isolation Kit	MAGH109
Mouse B Cell Isolation Kit	MAGM204
Mouse CD3 ⁺ T Cell Isolation Kit	MAGM201
Mouse Naïve CD4 ⁺ T Cell Isolation Kit	MAGM205
Mouse CD4 ⁺ T Cell Isolation Kit	MAGM202
Mouse Naïve CD8 ⁺ T Cell Isolation Kit	MAGM207
Mouse CD4 ⁺ CD25 ⁺ Regulatory T Cell Isolation Kit	MAGM208
Mouse CD8 ⁺ T Cell Isolation Kit	MAGM203
Mouse Hematopoietic Cell Lineage Depletion Kit	MAGM209
Mouse Natural Killer Cell Isolation Kit	MAGM210

CellXVivo™

Kits for Immune Cell Differentiation or Expansion



Browse All CellXVivo Kits

Scan the QR Code or Visit:

bio-techne.com/cellxvivo-kits

R&D Systems CellXVivo™ Immune Cell Differentiation and Expansion Kits contain optimized combinations of the highest quality proteins and antibodies, along with simple, reproducible protocols for the differentiation or expansion of dendritic cells, macrophages, Th1 cells, regulatory T cells, B cells, or natural killer cells.

Benefits of the kits include:

- Conveniently packages all reagents necessary for immune cell differentiation or expansion
- Guaranteed to produce consistent, reliable results
- Cost-effective and efficient

TABLE // 03

CellXVivo Differentiation or Expansion Kits

Product Name	Catalog #
Human B Cell Expansion Kit	CDK005
Human M1 Macrophage Differentiation Kit	CDK012
Human M2 Macrophage Differentiation Kit	CDK013
Human Monocyte-derived DC Differentiation Kit	CDK004
Human NK Cell Expansion Kit	CDK015
Human Th1 Cell Differentiation Kit	CDK001
Human Treg Cell Differentiation Kit	CDK006

FIGURE // 02

Phenotypic Analysis of Cultured Immature and Mature Monocyte-derived Dendritic Cells

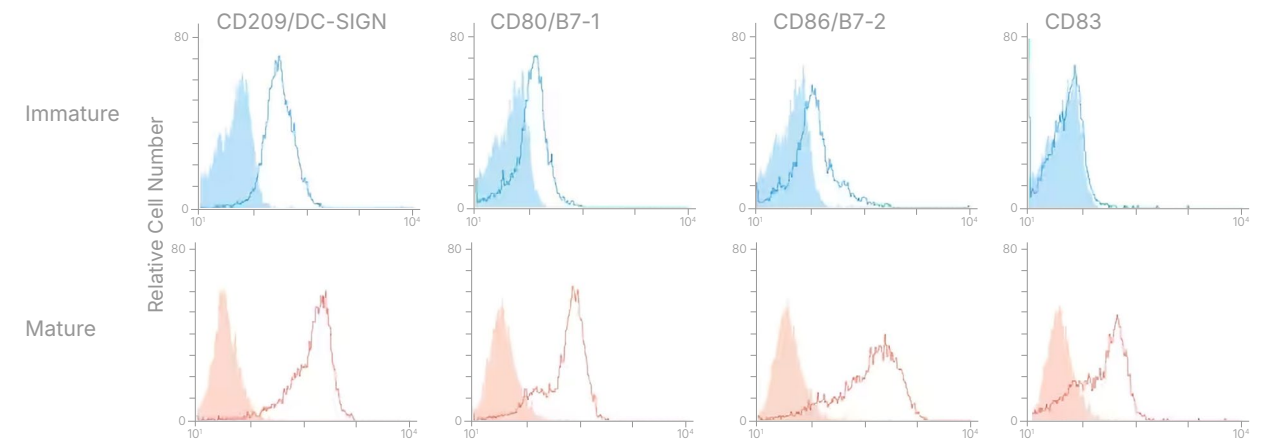


Figure 02. Following culture in complete monocyte-derived differentiation media provided in the [CellXVivo Human Monocyte-derived DC Differentiation Kit](#) (R&D Systems, Catalog # CDK004), day 7 immature dendritic cells (top) and day 10 TNF- α -treated mature dendritic cells (bottom) were stained with a [Mouse Anti-Human DC-SIGN/CD209 Monoclonal Antibody](#) (open histogram; R&D Systems, Catalog # MAB161), a [Mouse Anti-Human B7-1/CD80 Monoclonal Antibody](#) (open histogram; R&D Systems, Catalog # MAB140), a [Mouse Anti-Human B7-2/CD86 Monoclonal Antibody](#) (open histogram; R&D Systems, Catalog # MAB141), and a [Mouse Anti-Human CD83 Monoclonal Antibody](#) (open histogram; R&D Systems, Catalog # MAB1774), or an appropriate isotype control antibody (filled histograms).

Cell Culture Media



Browse Cell Culture Reagents

Scan the QR Code or Visit:

[bio-techne.com/reagents/cell-culture-reagents](https://www.bio-techne.com/reagents/cell-culture-reagents)

Bio-Techne offers a wide selection of standard cell culture media, including both RPMI 1640 and DMEM, as well as media supplements, fetal bovine serum, and cell culture antibiotics. With over 40 years of research and development experience, our cell culture portfolio provides both an unparalleled commitment to quality and exceptional product value.



TABLE // 04

Cell Culture Media

Product Name	Catalog #
RPMI 1640, 25mM HEPES, no glutamine	M30050
RPMI 1640, L-glutamine	M30150
RPMI 1640, 25mM HEPES, L-glutamine	M30250
RPMI 1640, L-glutamine, no phenol red	M30350
RPMI 1640, no glutamine	M30450
RPMI 1640, 25mM HEPES, no glutamine, no phenol red	M30550
RPMI 1640, no glutamine, no phenol red	M30650
RPMI 1640, 25mM HEPES, L-glutamine, no phenol red	M30750
RPMI 1640, GlutaminePlus	M30850
RPMI 1640, 25mM HEPES, GlutaminePlu	M31050
RPMI 1640, 25mM HEPES, GlutaminePlus, no phenol red	M31350
RPMI 1640, GlutaminePlus, no phenol red	M31550
DMEM, low glucose, no glutamine, sodium pyruvate	M12150

Product Name	Catalog #
DMEM, low glucose, no glutamine, no sodium pyruvate, no phenol red	M12250
DMEM, low glucose, 25mM HEPES, no glutamine, sodium pyruvate	M12350
DMEM, high glucose, no glutamine, sodium pyruvate	M12450
DMEM, low glucose, 25mM HEPES, no glutamine, sodium pyruvate, no phenol red	M12550
DMEM, low glucose, no glutamine, sodium pyruvate, no phenol red	M12650
DMEM, low glucose 25mM HEPES, glutamine, sodium pyruvate, no phenol red	M12750
DMEM, low glucose, glutamine, sodium pyruvate, no phenol red	M12850
DMEM, high glucose, L-glutamine, no sodium pyruvate, no phenol red	M12950
DMEM, low glucose, 25mM HEPES, GlutaminePlus, sodium pyruvate	M13050
DMEM, low glucose, 25mM HEPES, GlutaminePlus, sodium pyruvate, no phenol red	M13150
DMEM, low glucose, GlutaminePlus, sodium pyruvate	M13250

TABLE // 04 CONTINUED

Cell Culture Media

Product Name	Catalog #
DMEM, low glucose, GlutaminePlus, sodium pyruvate, no phenol red	M13350
DMEM, low glucose, 25mM HEPES, no glutamine, no sodium pyruvate	M13850
DMEM, low glucose, 25mM HEPES, no glutamine, no sodium pyruvate, no phenol red	M13950
DMEM, low glucose, no glutamine, no sodium pyruvate	M14050
DMEM, low glucose, 25mM HEPES, glutamine, no sodium pyruvate	M17050
DMEM, low glucose, 25mM HEPES, glutamine, no sodium pyruvate, no phenol red	M17150
DMEM, low glucose, glutamine, no sodium pyruvate	M17250
DMEM, low glucose, glutamine, no sodium pyruvate, no phenol red	M17350
DMEM, low glucose, 25mM HEPES, GlutaminePlus, no sodium pyruvate	M17450
DMEM, low glucose, 25mM HEPES, GlutaminePlus, no sodium pyruvate, no phenol red	M17550
DMEM, low glucose, GlutaminePlus, no sodium pyruvate	M17650
DMEM, low glucose, GlutaminePlus, no sodium pyruvate, no phenol red	M17750
DMEM, high glucose, 25mM HEPES, no glutamine, sodium pyruvate	M18250
DMEM, high glucose, 25mM HEPES, no glutamine, sodium pyruvate, no phenol red	M18350
DMEM, high glucose, no glutamine, sodium pyruvate, no phenol red	M18450
DMEM, high glucose, 25mM HEPES, L-glutamine, sodium pyruvate, no phenol red	M18550
DMEM, high glucose, L-glutamine, sodium pyruvate, no phenol red	M18650
DMEM, high glucose, 25mM HEPES, GlutaminePlus, sodium pyruvate	M18750

Product Name	Catalog #
DMEM, high glucose, 25mM HEPES, GlutaminePlus, sodium pyruvate, no phenol red	M18850
DMEM, high glucose, GlutaminePlus, sodium pyruvate	M18950
DMEM, high glucose, GlutaminePlus, sodium pyruvate, no phenol red	M19050
DMEM, high glucose, 25mM HEPES, no glutamine, no sodium pyruvate	M19550
DMEM, high glucose, 25 mM HEPES, no glutamine, no sodium pyruvate, no phenol red	M19650
DMEM, high glucose, 25mM HEPES, L-glutamine, no sodium pyruvate, no phenol red	M19750
DMEM, high glucose, 25mM HEPES, GlutaminePlus, no sodium pyruvate	M19850
DMEM, high glucose, 25mM HEPES, GlutaminePlus, no sodium pyruvate, no phenol red	M19950
DMEM, low glucose, glutamine, sodium pyruvate	M22150
DMEM, high glucose, L-glutamine, no sodium pyruvate	M22250
DMEM, low glucose, 25 mM HEPES, glutamine, sodium pyruvate	M22350
DMEM, high glucose, L-glutamine, sodium pyruvate	M22450
DMEM, high glucose, 25mM HEPES, L-glutamine, no sodium pyruvate	M22550
DMEM, high glucose, 25mM HEPES, L-glutamine, sodium pyruvate	M22650
DMEM, high glucose, no glutamine, no sodium pyruvate	M22850
DMEM, high glucose, no glutamine, no sodium pyruvate, no phenol red	M22950
DMEM, high glucose, GlutaminePlus, no sodium pyruvate, no phenol red	M32350
DMEM, high glucose, GlutaminePlus, no sodium pyruvate	M32650

FBS

Classic Fetal Bovine Serum



Browse Cell Culture Reagents

Scan the QR Code or Visit:

bio-techne.com/reagents/cell-culture-reagents

Fetal bovine serum (FBS) is the ideal growth supplement for cell culture media and is generally preferred over other types of sera due to its high levels of nutrients and optimal combination of growth factors.

R&D Systems FBS is produced utilizing strict manufacturing processes and quality assurance procedures, which guarantees unsurpassed quality and consistency from lot-to-lot.



TABLE // 05

Available Fetal Bovine Serum

Product Name	Size	Regular Catalog #	Heat-Inactivated Catalog #
Fetal Bovine Serum - Optima	50 mL	S12495	S12495H
	100 mL	S12410	S12410H
	500 mL	S12450	S12450H
Fetal Bovine Serum - Premium	50 mL	S11195	S11195H
	100 mL	S11110	S11110H
	500 mL	S11150	S11150H
Fetal Bovine Serum - Premium Select	50 mL	S11595	S11595H
	100 mL	S11510	S11510H
	500 mL	S11550	S11550H

Proteins

For Immune Cell Differentiation or Expansion



Browse Proteins for Immune Cell Culture

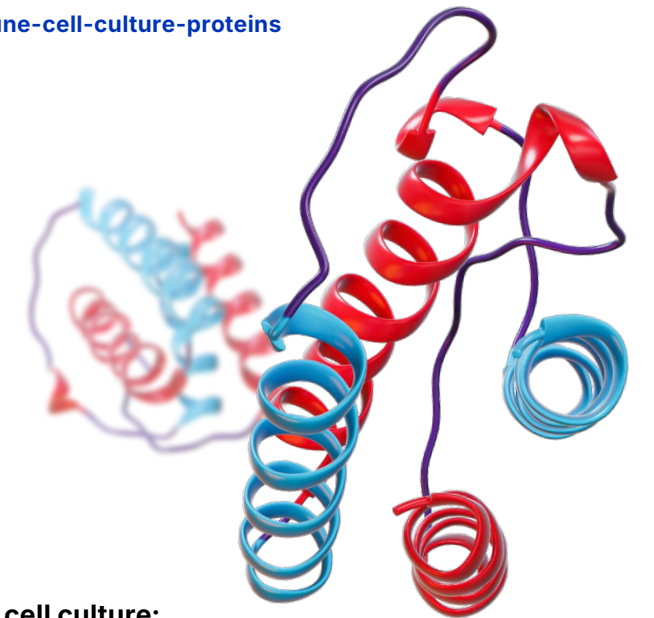
Scan the QR Code or Visit:

bio-techne.com/reagents/proteins/immune-cell-culture-proteins

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.

From basic research to clinical applications, we offer research-grade, Animal-free preclinical, and GMP-grade proteins to meet all your experimental needs.



Benefits of R&D Systems cytokines for immune cell culture:

- **High Levels of Biological Activity:** The biological activity of every protein we offer is tested in an appropriate bioassay to confirm that it meets our strict QC activity parameters.
- **Lot-to-Lot Consistency:** Minimal lot-to-lot variability is ensured by testing each new lot side-by-side with previous lots and with a master lot, so you don't have to worry whether results will be reproducible over time.
- **High Purity and Low Endotoxin Levels:** Our proteins are typically over 95% pure and have a guaranteed industry-leading endotoxin level of <0.1 EU/ug by the LAL method.
- **Supply Chain Reliability:** Our team has the experience and the capacity to ensure that we can provide you with a stable supply of the proteins you need for your research.
- **Seamless Transition from Preclinical Research to Clinical Manufacturing:** R&D Systems Animal-free Preclinical and Animal-free GMP proteins frequently originate from the same clone, sequence, and expression system to make the transition from preclinical research into clinical manufacturing as seamless as possible.
- **Bulk Proteins at Discounted Prices:** We have the ability to scale up the production of any protein and we offer economical pricing on bulk orders.
- **Custom Protein Capabilities:** For specialized protein requests, you can always contact our Custom Protein Services team. Whether you are looking for a different formulation of a protein, incorporation of a non-standard label, or custom bottling, we have the capabilities and the team to develop the protein that you need.



Custom Protein Services

If you don't find the protein you need on our website, please contact us. From-scratch development to customizing an existing catalog protein, our Custom Protein Services Team will create the protein to fit your experimental needs.

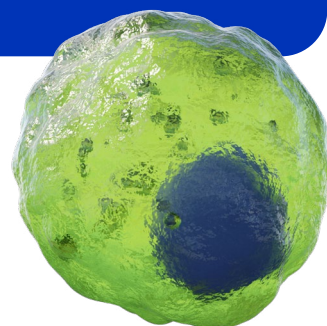


Contact Custom Protein Services

Scan the QR Code or Visit:
bio-techne.com/services/custom-protein-services

Proteins For Immune Cell Differentiation or Expansion

The following section includes tables of research-grade proteins and antibodies (when applicable) that are frequently used to expand, differentiate, and activate various immune cell types. Animal-free preclinical and GMP-grade proteins are listed towards the end.



Cytokines for T Cell Culture or Differentiation



Learn More About T Cell Culture

Scan the QR Code or Visit:
bio-techne.com/reagents/proteins/immune-cell-culture-proteins#t-cells

TABLE // 06

Cytokines for T Cell Culture or Differentiation

Molecule	Species	Source	Catalog #
B7-H2/ ICOS Ligand	Human	NS0	165-B7
	Human	HEK293	8206-B7
	Mouse	NS0	8127-B7
	Mouse	NS0	158-B7
BMP-4*	Human	<i>E. coli</i>	314-BPE
	Human	NS0	314-BP
	Mouse	CHO	5020-BP

Molecule	Species	Source	Catalog #
FGF basic/ FGF2/ bFGF*	Human	<i>E. coli</i>	3718-FB
	Human	<i>E. coli</i>	4114-TC
	Mouse	<i>E. coli</i>	3139-FB
Flt-3 Ligand/ FLT3L*	Human	HEK293	308-FKHB
	Human	HEK293	11309-FKH
	Human	NS0	308-FKN
	Human	<i>E. coli</i>	308-FKE
	Mouse	NS0	427-FL

*GMP-grade proteins available for this molecule

TABLE // 06 CONTINUED

Cytokines for T Cell Culture or Differentiation

Molecule	Species	Source	Catalog #
IFN- γ *	Human	<i>E. coli</i>	285-IF
	Human	HEK293	10067-IF
	Mouse	<i>E. coli</i>	485-MI
IL-1 β *	Human	<i>E. coli</i>	201-LB
	Mouse	<i>E. coli</i>	401-ML
IL-2*	Human	<i>E. coli</i>	BT-002
	Human	CHO	10453-IL
IL-4*	Human	<i>E. coli</i>	BT-004
	Human	CHO	6507-IL
	Mouse	<i>E. coli</i>	404-ML
IL-6*	Human	<i>E. coli</i>	206-IL
	Human	HEK293	7270-IL
IL-7*	Mouse	<i>E. coli</i>	406-ML
	Human	<i>E. coli</i>	BT-007
IL-10*	Human	HEK293	11089-IL
	Mouse	<i>E. coli</i>	407-ML
	Human	<i>E. coli</i>	1064-ILB
IL-12	Human	<i>Sf21</i> (stably transfected)	217-ILB
	Human	HEK293	11178-IL
	Human	<i>E. coli</i>	1064-IL
	Mouse	<i>E. coli</i>	417-ML
	Human	<i>Sf21</i> (baculovirus)	219-IL
IL-15*	Human	<i>E. coli</i>	BT-015
	Human	HEK293	10067-IF
	Mouse	<i>E. coli</i>	485-MI
IL-18/IL-1F4	Human	<i>E. coli</i>	9124-IL
	Human	<i>E. coli</i>	B001-5
IL-21*	Mouse	<i>E. coli</i>	9139-IL
	Mouse	<i>E. coli</i>	B002-5
	Human	<i>E. coli</i>	8879-IL
IL-23	Human	<i>Sf21</i> (baculovirus)	1290-IL
	Mouse	<i>Sf21</i> (stably transfected)	1887-ML
IL-27	Human	NS0	2526-IL
	Mouse	NS0	2799-IL
SCF*	Human	<i>E. coli</i>	BT-SCF
	Human	HEK293	11010-SC
TGF- β 1*	Human	<i>E. coli</i>	455-MC
	Human	HEK293	7754-BH
Thrombopoietin*	Mouse	CHO	7666-MB
	Human	<i>E. coli</i>	288-TPE
	Human	NS0	288-TPN
TNF- α *	Mouse	NS0	488-TO
	Human	<i>E. coli</i>	210-TA
	Human	HEK293	10291-TA
	Mouse	<i>E. coli</i>	410-MT
IL-12	Human	<i>E. coli</i>	410-TRNC
	Mouse	<i>E. coli</i>	410-TRNC
IL-12	Human	<i>Sf21</i> (baculovirus)	219-IL
	Human	HEK293	10018-IL
	Mouse	<i>Sf21</i> (baculovirus)	419-ML
IL-15*	Human	<i>E. coli</i>	285-IF
	Human	HEK293	10067-IF
IL-18/IL-1F4	Human	<i>E. coli</i>	9124-IL
	Human	<i>E. coli</i>	B001-5
IL-21*	Mouse	<i>E. coli</i>	9139-IL
	Mouse	<i>E. coli</i>	B002-5
IL-23	Human	<i>Sf21</i> (baculovirus)	1290-IL
	Mouse	<i>Sf21</i> (stably transfected)	1887-ML
IL-27	Human	NS0	2526-IL
	Mouse	NS0	2799-IL
SCF*	Human	<i>E. coli</i>	BT-SCF
	Human	HEK293	11010-SC
TGF- β 1*	Human	<i>E. coli</i>	455-MC
	Human	HEK293	7754-BH
Thrombopoietin*	Mouse	CHO	7666-MB
	Human	<i>E. coli</i>	288-TPE
	Human	NS0	288-TPN
TNF- α *	Mouse	NS0	488-TO
	Human	<i>E. coli</i>	210-TA
	Human	HEK293	10291-TA
	Mouse	<i>E. coli</i>	410-MT
IL-12	Human	<i>E. coli</i>	410-TRNC
	Mouse	<i>E. coli</i>	410-TRNC
IL-12	Human	<i>Sf21</i> (baculovirus)	219-IL
	Human	HEK293	10018-IL
	Mouse	<i>Sf21</i> (baculovirus)	419-ML
IL-15*	Human	<i>E. coli</i>	285-IF
	Human	HEK293	10067-IF
IL-18/IL-1F4	Human	<i>E. coli</i>	9124-IL
	Human	<i>E. coli</i>	B001-5
IL-21*	Mouse	<i>E. coli</i>	9139-IL
	Mouse	<i>E. coli</i>	B002-5
IL-23	Human	<i>Sf21</i> (baculovirus)	1290-IL
	Mouse	<i>Sf21</i> (stably transfected)	1887-ML
IL-27	Human	NS0	2526-IL
	Mouse	NS0	2799-IL
SCF*	Human	<i>E. coli</i>	BT-SCF
	Human	HEK293	11010-SC
TGF- β 1*	Human	<i>E. coli</i>	455-MC
	Human	HEK293	7754-BH
Thrombopoietin*	Mouse	CHO	7666-MB
	Human	<i>E. coli</i>	288-TPE
	Human	NS0	288-TPN
TNF- α *	Mouse	NS0	488-TO
	Human	<i>E. coli</i>	210-TA
	Human	HEK293	10291-TA
	Mouse	<i>E. coli</i>	410-MT
IL-12	Human	<i>E. coli</i>	410-TRNC
	Mouse	<i>E. coli</i>	410-TRNC
IL-12	Human	<i>Sf21</i> (baculovirus)	219-IL
	Human	HEK293	10018-IL
	Mouse	<i>Sf21</i> (baculovirus)	419-ML

*GMP-grade proteins available for this molecule

Antibodies for T Cell Culture or Differentiation



Learn More About T Cell Culture

Scan the QR Code or Visit:

[bio-techne.com/reagents/proteins/immune-cell-culture-proteins#t-cells](https://www.bio-techne.com/reagents/proteins/immune-cell-culture-proteins#t-cells)



ANTIBODY APPLICATION KEY

B/N	Blocking/Neutralization	Ecap	ELISA Capture	IHC	Immunohistochemistry
CyTOF-ready	Mass Cytometry	FA	Functional Assay	IP	Immunoprecipitation
CyTOF-reported	Mass Cytometry	FC	Flow Cytometry	WB	Western Blot
Depl	Cell Depletion	ICC/IF	Immunocytochemistry/Immunofluorescence		

TABLE // 07

Antibodies for T Cell Culture or Differentiation

Molecule	Species	Source	Catalog #	Antibody Application
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, IHC, IP
CD28	Human	37407	MAB342	FA, ICC/IF, WB
	Human	Polyclonal	AF-342-PB	CyTOF-ready, FA, FC, ICC/IF, IHC
	Mouse	794716	MAB4832	CyTOF-ready, FA, FC
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

Cytokines for Natural Killer (NK) Cell Culture



Learn More About NK Cell Culture

Scan the QR Code or Visit:

[bio-techne.com/reagents/proteins/immune-cell-culture-proteins#natural-killer-cells](https://www.bio-techne.com/reagents/proteins/immune-cell-culture-proteins#natural-killer-cells)

TABLE // 08

Cytokines for NK Cell Culture

Molecule	Species	Source	Catalog #
BMP-4*	Human	<i>E. coli</i>	314-BPE
	Human	NS0	314-BP
	Mouse	CHO	5020-BP
Flt-3 Ligand/FLT3L*	Human	HEK293	308-FKHB
	Human	HEK293	11309-FKH
	Human	NS0	308-FKN
	Human	<i>E. coli</i>	308-FKE
	Mouse	NS0	427-FL
IFN- γ *	Human	<i>E. coli</i>	285-IF
	Human	HEK293	10067-IF
IL-2*	Human	<i>E. coli</i>	BT-002
	Human	CHO	10453-IL
IL-3*	Human	<i>E. coli</i>	203-ML
	Mouse	<i>E. coli</i>	403-ML
IL-7*	Human	<i>E. coli</i>	BT-007
	Human	HEK293	11089-IL
IL-12	Human	<i>Sf21</i> (baculovirus)	219-IL
	Human	HEK293	10018-IL
IL-15*	Human	<i>E. coli</i>	BT-015
	Human	HEK293	10051-ML
IL-18/IL-1F4	Human	<i>E. coli</i>	9124-IL
	Human	<i>E. coli</i>	B001-5
IL-21*	Human	<i>E. coli</i>	8879-IL
	Human	<i>E. coli</i>	594-ML
SCF*	Human	<i>E. coli</i>	BT-SCF
	Human	HEK293	11010-SC
VEGF*	Human	<i>E. coli</i>	455-MC
	Human	<i>E. coli</i>	BT-VEGF
IL-21*	Human	<i>Sf21</i> (baculovirus)	293-VE
	Human	<i>Sf21</i> (baculovirus)	493-MV

*GMP-grade proteins available for this molecule

Antibodies for Monocyte/Macrophage Culture



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FIGURE // 03

Differentiation and Characterization of M1 and M2 Macrophages.

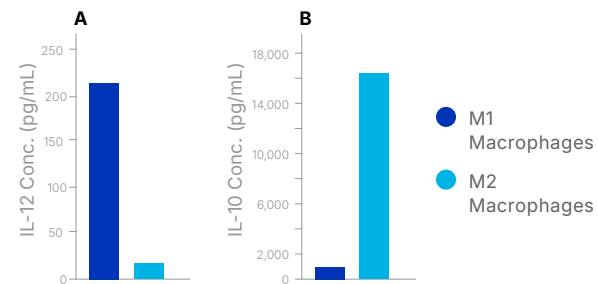


Figure 03. Enriched human CD14⁺ monocytes were cultured in the presence of either **Recombinant Human GM-CSF** (R&D Systems, Catalog # 215-GM) or **Recombinant Human M-CSF** (R&D Systems, Catalog # 216-MC) for 6 days in serum-free base media to promote the differentiation of M1 or M2 macrophages, respectively. 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).

TABLE // 09

Cytokines for Monocyte/Macrophage Culture

Molecule	Species	Source	Catalog #
GM-CSF*	Human	<i>E. coli</i>	215-GM
	Human	CHO	7954-GM
	Mouse	<i>E. coli</i>	415-ML
IFN- γ *	Human	<i>E. coli</i>	285-IF
	Human	HEK293	10067-IF
	Mouse	<i>E. coli</i>	485-MI
IL-4*	Human	<i>E. coli</i>	BT-004
	Human	CHO	6507-IL
	Mouse	<i>E. coli</i>	404-ML
IL-6*	Human	<i>E. coli</i>	206-IL
	Human	HEK293	7270-IL
	Mouse	<i>E. coli</i>	406-ML
IL-10*	Human	<i>E. coli</i>	1064-ILB
	Human	Sf21 (stably transfected)	217-ILB

Molecule	Species	Source	Catalog #
IL-10*	Human	HEK293	11178-IL
	Human	<i>E. coli</i>	1064-IL
	Mouse	<i>E. coli</i>	417-ML
IL-13	Human	<i>E. coli</i>	213-ILB
	Mouse	<i>E. coli</i>	413-ML
M-CSF*	Human	<i>E. coli</i>	216-MC
	Human	CHO	216-MCC
	Mouse	<i>E. coli</i>	416-ML
SCF*	Human	<i>E. coli</i>	BT-SCF
	Human	HEK293	11010-SC
	Mouse	<i>E. coli</i>	455-MC
Thrombopoietin*	Human	<i>E. coli</i>	288-TPE
	Human	NSO	288-TPN
	Mouse	NSO	488-TO

*GMP-grade proteins available for this molecule

Cytokines for Dendritic Cell Culture



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[bio-techne.com/reagents/proteins/immune-cell-culture-proteins#dendritic-cells](https://www.bio-techne.com/reagents/proteins/immune-cell-culture-proteins#dendritic-cells)

TABLE // 10

Cytokines for Dendritic Cell Culture

Molecule	Species	Source	Catalog #
BMP-4*	Human	<i>E. coli</i>	314-BPE
	Human	NSO	314-BP
	Mouse	CHO	5020-BP
Flt-3 Ligand/FLT3L*	Human	HEK293	308-FKHB
	Human	HEK293	11309-FKH
	Human	NSO	308-FKN
	Human	<i>E. coli</i>	308-FKE
	Mouse	NSO	427-FL
GM-CSF*	Human	<i>E. coli</i>	215-GM
	Human	CHO	7954-GM
	Mouse	<i>E. coli</i>	415-ML
IFN- γ *	Human	<i>E. coli</i>	285-IF
	Human	HEK293	10067-IF
	Mouse	<i>E. coli</i>	485-MI
IL-1 β *	Human	<i>E. coli</i>	201-LB
	Mouse	<i>E. coli</i>	401-ML
IL-3*	Human	<i>E. coli</i>	203-ML
	Mouse	<i>E. coli</i>	403-ML
IL-4*	Human	<i>E. coli</i>	BT-004
	Human	CHO	6507-IL
	Mouse	<i>E. coli</i>	404-ML



Molecule	Species	Source	Catalog #
M-CSF*	Human	<i>E. coli</i>	216-MC
	Human	CHO	216-MCC
	Mouse	<i>E. coli</i>	416-ML
SCF*	Human	<i>E. coli</i>	BT-SCF
	Human	HEK293	11010-SC
	Mouse	<i>E. coli</i>	455-MC
Thrombopoietin*	Human	<i>E. coli</i>	288-TPE
	Human	NSO	288-TPN
	Mouse	NSO	488-TO
TNF- α *	Human	<i>E. coli</i>	210-TA
	Human	HEK293	10291-TA
	Mouse	<i>E. coli</i>	410-MT
VEGF*	Mouse	<i>E. coli</i>	410-TRNC
	Human	<i>E. coli</i>	BT-VEGF
	Human	Sf21 (baculovirus)	293-VE
	Mouse	Sf21 (baculovirus)	493-MV

*GMP-grade proteins available for this molecule

Cytokines for B Cell Culture



Learn More About B Cell Culture

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TABLE // 11

Cytokines for B Cell Culture

Molecule	Species	Source	Catalog #
BAFF/Blys/ TNFSF13B	Human	CHO	7537-BF
	Human	NSO	2149-BF
	Mouse	NSO	8876-BF
CD40 Ligand/ TNFSF5	Human	<i>E. coli</i>	2706-CL
	Human	<i>E. coli</i>	6245-CL
	Mouse	CHO	8230-CL
Flt-3 Ligand/ FLT3L*	Human	HEK293	308-FKHB
	Human	HEK293	11309-FKH
	Human	NSO	308-FKN
	Human	<i>E. coli</i>	308-FKE
	Mouse	NSO	427-FL
IFN- γ *	Human	<i>E. coli</i>	285-IF
	Human	HEK293	10067-IF
	Mouse	<i>E. coli</i>	485-MI

Molecule	Species	Source	Catalog #
IL-2*	Human	<i>E. coli</i>	BT-002
	Human	CHO	10453-iL
	Mouse	<i>E. coli</i>	402-MI
IL-4*	Human	<i>E. coli</i>	BT-004
	Human	CHO	6507-IL
	Mouse	<i>E. coli</i>	404-ML
IL-7*	Human	<i>E. coli</i>	BT-007
	Human	HEK293	11089-IL
	Mouse	<i>E. coli</i>	407-ML
IL-10*	Human	<i>E. coli</i>	1064-ILB
	Human	<i>Sf21</i> (stably transfected)	217-ILB
	Human	HEK293	11178-IL
	Human	<i>E. coli</i>	1064-IL
	Mouse	<i>E. coli</i>	417-ML
IL-21*	Human	<i>E. coli</i>	8879-IL
	Mouse	<i>E. coli</i>	594-ML

*GMP-grade proteins available for this molecule

FIGURE // 04

Expansion of Mouse B Cells

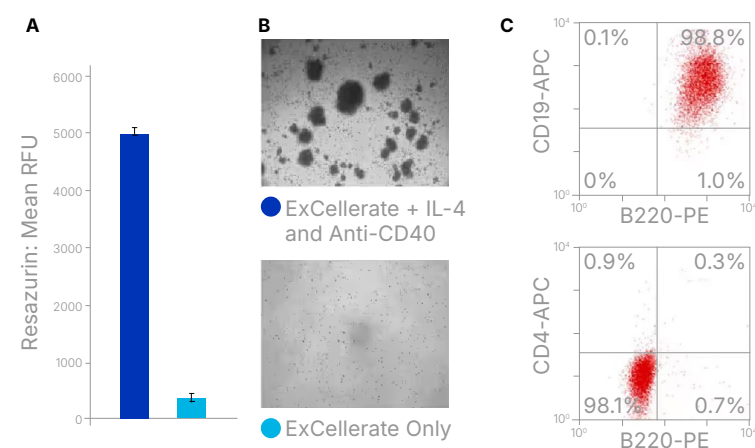


Figure 04. Expansion of Mouse B Cells with ExCellerate Human B Cell Expansion Media Supplemented with IL-4 and an Anti-Mouse CD40 Antibody. Mouse B cells were isolated from splenocytes using the **MagCelect™ Mouse B Cell Isolation Kit** (R&D Systems, Catalog # MAGM204) and expanded using **ExCellerate B Cell Media** (R&D Systems, Catalog # CCM031) with or without **Recombinant Mouse IL-4** (R&D Systems, Catalog # 404-ML) and a **Rat Anti-Mouse CD40/TNFRSF5 Monoclonal Antibody** (R&D Systems, Catalog # MAB440). (A) Expansion of mouse B cells was monitored using Resazurin. 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.

Cytokines for Granulocyte Culture



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Scan the QR Code or Visit:

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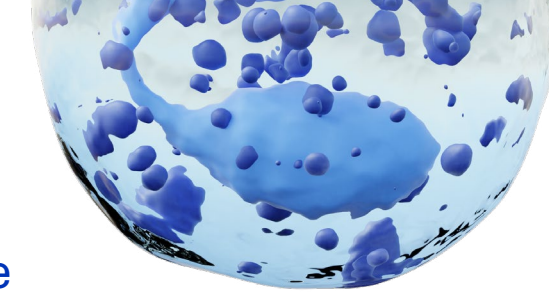


TABLE // 12

Cytokines for Granulocyte Cell Culture

Molecule	Species	Source	Catalog #
G-CSF	Human	<i>E. coli</i>	214-CS
	Mouse	<i>E. coli</i>	414-CS
GM-CSF*	Human	<i>E. coli</i>	215-GM
	Human	CHO	7954-GM
	Mouse	<i>E. coli</i>	415-ML
IL-3*	Human	<i>E. coli</i>	203-IL
	Mouse	<i>E. coli</i>	403-ML
IL-5	Human	<i>Sf21</i> (stably transfected)	205-ML
	Mouse	<i>Sf21</i> (stably transfected)	405-ML
IL-6*	Human	<i>E. coli</i>	206-IL
	Human	HEK293	7270-IL
	Mouse	<i>E. coli</i>	406-ML

Molecule	Species	Source	Catalog #
M-CSF*	Human	<i>E. coli</i>	216-MC
	Human	CHO	216-MCC
	Mouse	<i>E. coli</i>	416-ML
SCF*	Human	<i>E. coli</i>	BT-SCF
	Human	HEK293	11010-SC
	Mouse	<i>E. coli</i>	455-MC
Thrombopoietin*	Human	<i>E. coli</i>	288-TPE
	Human	NSO	288-TPN
	Mouse	NSO	488-TO
VEGF*	Human	<i>E. coli</i>	BT-VEGF
	Human	<i>Sf21</i> (baculovirus)	293-VE
	Mouse	<i>Sf21</i> (baculovirus)	493-MV

*GMP-grade proteins available for this molecule

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- 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.
- 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:

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

FIGURE // 05

T Cell Expansion with R&D Systems' Animal-Free and GMP-Grade Proteins

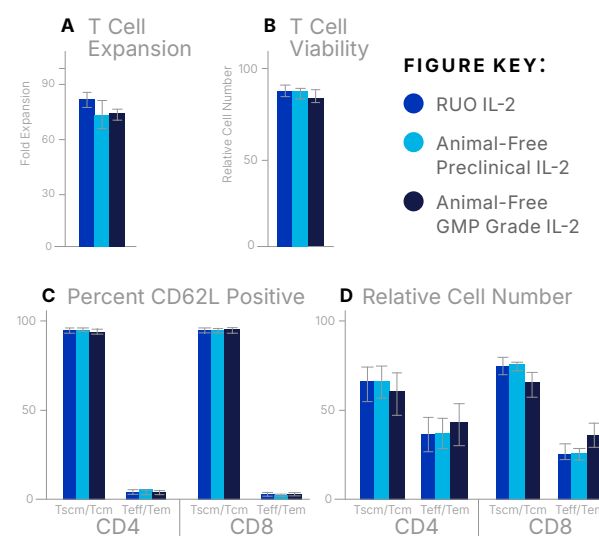


Figure 05. Animal-Free and GMP-Grade Protein Expansion of T Cells with R&D Systems' Research-grade, Animal-free Preclinical, and Animal-free GMP-grade IL-2 Proteins. PMBCs were analyzed for (A) expansion (B) viability and (C, D) phenotype. Histogram bars represent the average of 3 donors. (C, D) Cells were analyzed by flow cytometry to determine the percentages of CD4+ or CD8+ T stem cell memory or central memory (Tscm/Tcm) cells compared with the percentages of effector or effector memory T cells (Teff/Tem) using antibodies against CD62L and CCR7. Little difference was observed in the CD4+ and CD8+ T cell phenotypes generated with the different IL-2 products.

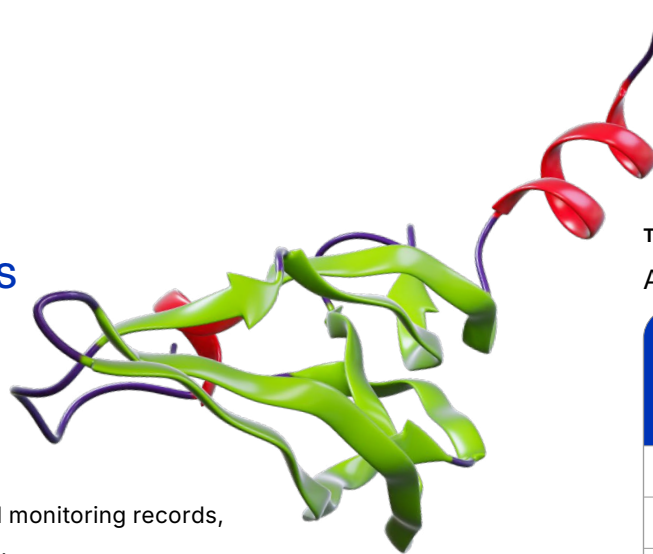


TABLE // 13

Animal-Free and GMP-Grade Proteins

Protein Human Source: <i>E. coli</i>	Catalog # Animal-Free GMP-Grade Protein	Catalog # Animal-Free Preclinical Protein
Betacellulin	BT-BTC-GMP*	BT-BTC-AFL
BMP-4	314E-GMP	AFL314E
EGF	236-GMP*	AFL236
FGF basic (145 aa)	3718-GMP	AFL3718
Flt-3 Ligand/FLT3L	308E-GMP*	AFL308E
GM-CSF	215-GMP	AFL215
IFN- γ	285-GMP*	AFL285
IGF-I	291-GMP	AFL291
LR3 IGF-I	8335D-GMP	
IL-1 β /IL-1F2	201-GMP	AFL201
IL-2	BT-002-GMP*	BT-002-AFL
IL-3	203-GMP	AFL203
IL-4	BT-004-GMP Coming Soon	BT-004-AFL
IL-6	206-GMP	AFL206
IL-7	BT-007-GMP*	BT-007-AFL
IL-10	1064-GMP	AFL1064
IL-15	BT-015-GMP*	BT-015-AFL
IL-21	8879-GMP*	AFL8879
M-CSF	216-GMP	AFL216
PDGF-AA	221-GMP	AFL221
PDGF-BB	220-GMP	AFL220
SCF/c-kit Ligand	BT-SCF-GMP	BT-SCF-AFL
Shh N-terminus	1314-GMP	
Shh (C2411) N-terminus	1845-GMP	AFL1845
Thrombopoietin	288E-GMP	AFL288 Coming Soon
TNF- α	210-GMP	AFL210
VEGF	BT-VEGF-GMP	BT-VEGF-AFL

*DMF has been filed for this GMP protein

Additional GMP-Grade Proteins From Bio-Techne

There are some instances when a protein requires production in a eukaryotic system to maintain activity. This may be due to protein folding or post-translational modifications that can only be accomplished by making the protein in a eukaryotic cell line. These GMP-grade proteins, which are not considered to be animal-free, are listed in the Table 14. Whenever a GMP-grade protein cannot be produced in an animal-free process, it is always clearly indicated on our website.

R&D Systems GMP-grade proteins are intended for use as ancillary materials in GMP manufacturing of investigational or marketed clinical products, such as cell therapy, gene therapy, tissue-engineered products, combination products, or other Advanced Therapy Medicinal Products. They are not therapeutic products or excipient and are not suitable for direct administration to humans.



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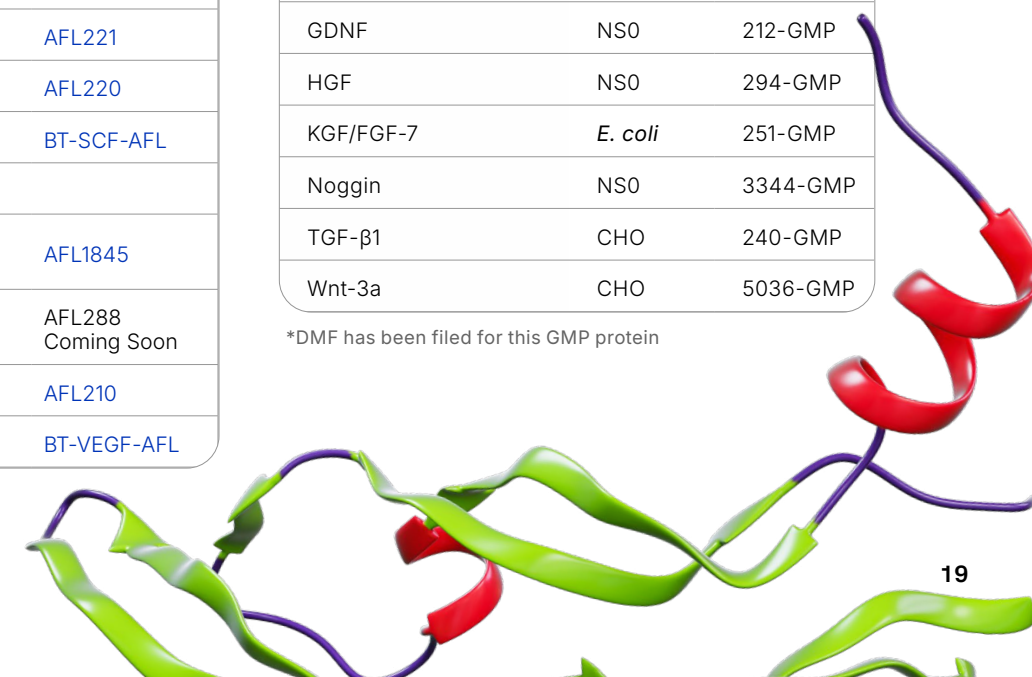
TABLE // 14

GMP-Grade Proteins

Protein (human)	Source	Catalog #
Activin A	CHO	338-GMP*
BMP-2	CHO	355-GMP
GDF-8/Myostatin	NS0	788-GMP
GDNF	NS0	212-GMP
HGF	NS0	294-GMP
KGF/FGF-7	<i>E. coli</i>	251-GMP
Noggin	NS0	3344-GMP
TGF- β 1	CHO	240-GMP
Wnt-3a	CHO	5036-GMP

*DMF has been filed for this GMP protein

*GMP-grade IL-2, IL-7 and IL-15, as well as G-Rex[®] and Lovo[®], are available through our joint venture partnership with ScaleReady. G-Rex[®] is a registered trademark of Wilson Wolf Corporation. Lovo[®] is a registered trademark of Fresenius Kabi.



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