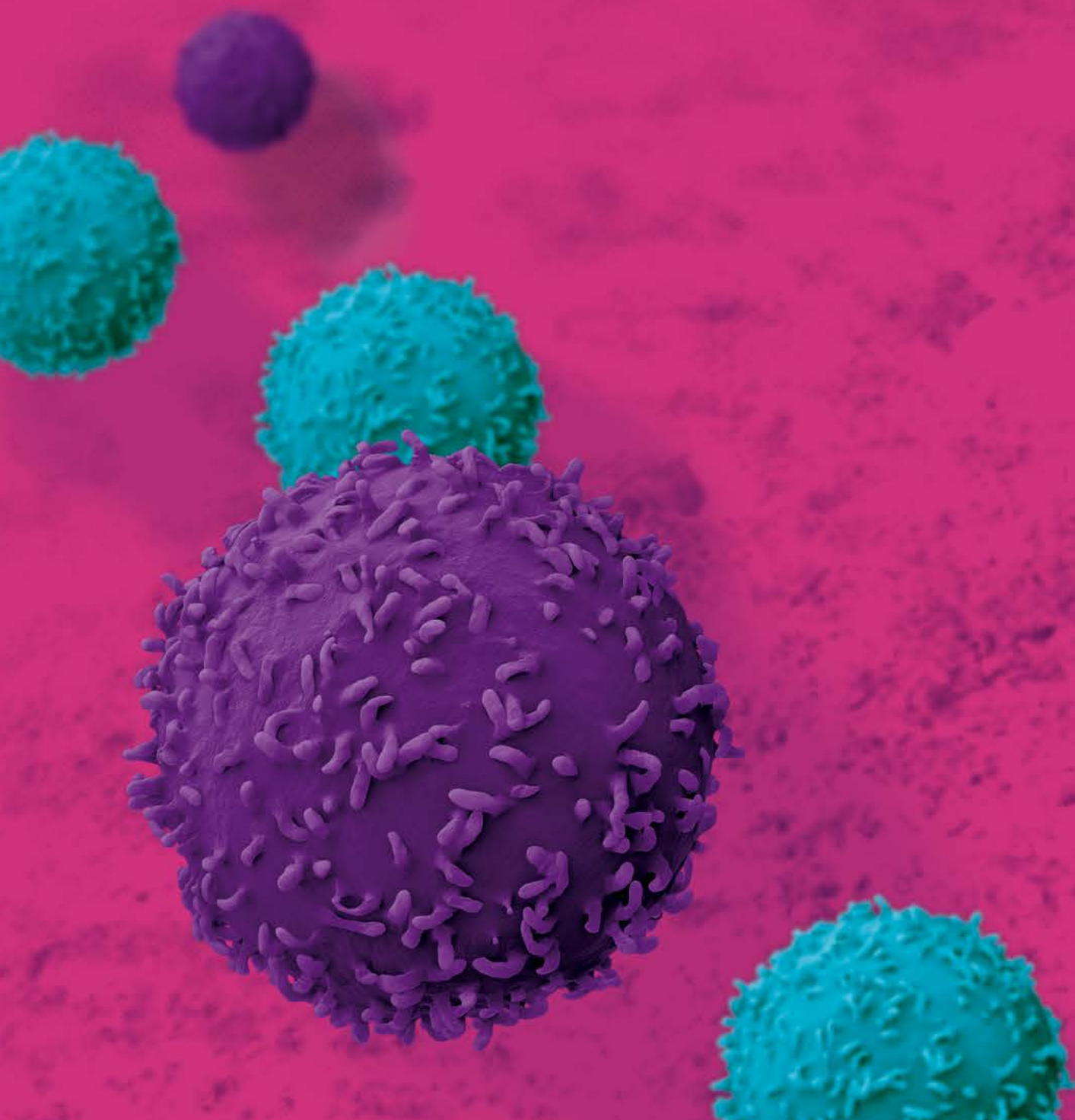




Miltenyi Biotec

# T cell research

The complete product portfolio



# Advance your T cell research

Whatever your T cell research interest, our tools and products can support you throughout every step of your workflow. From sample preparation to cell isolation and cell culture to analysis.

With our gentle sample preparation solutions you can obtain viable single-cell suspensions from any tissue to commence your T cell research. The MACS® Cell Separation portfolio enables you to choose the cell isolation option that is best for your specific requirements, allowing you to select your T cell subset of choice. Optimized cell culture products offer you the best conditions for your T cells. Finally, our large antibody portfolio and innovative flow cytometry solutions ensure you precise analysis.

We want to collaborate with you. Benefit from our full range of instruments and reagents as well our expertise and trusted support in any T cell matter. Optimize your experimental workflows and target your next publication.





## Contents

- 4 Sample preparation
- 6 Cell separation
- 14 Cell culture
- 18 Cell stimulation
- 20 Flow analysis
- 24 Cell separation product portfolio

## Fast

Process up to eight samples in parallel with the gentleMACS™ Octo Dissociator

## Gentle

Obtain viable single-cell suspensions with preserved epitopes

## Reproducible

Pre-defined enzyme mixes and dissociation programs for standardized tissue processing

## Safe

Sample processing in a closed and sterile system



# Start smart

Our sample preparation portfolio offers gentle and versatile tissue dissociation, allowing for standardized and reproducible results. With our gentleMACS™ Dissociators, process samples into viable, single-cell suspensions. The preservation of cell surface epitopes ensure reliability for downstream T cell applications.

# The secret to success lies in your starting material

## gentleMACS™ Dissociators

Our versatile benchtop tissue dissociators can process up to eight samples in parallel. Automated, programmable and with optional temperature regulation to ensure the highest reproducibility.

## gentleMACS Tubes

Our gentleMACS™ C Tubes are optimized for use with gentleMACS Dissociators to guarantee the highest quality tissue dissociation or homogenization.



## MACS® Tissue Dissociation Kits

Combine the gentleMACS Instrument's mechanical dissociation with enzymatic treatment for excellent yield, high viability, and preserved cell epitopes. Reproducible T cell isolation even from difficult to process human and mouse tissues.

**VIDEO**

Watch our video to learn about the gentle, rapid, and effective generation of single-cell suspensions from human formalin-fixed paraffin-embedded (FFPE) carcinoma sections.

► [miltenyibiotec.com/DissociateFFPE](https://miltenyibiotec.com/DissociateFFPE)

A close-up photograph of a MACS Cell Separation System. The machine features a prominent orange vertical column and a black horizontal arm that holds a sample tray. A thin metal needle is positioned to dispense liquid into a tray of clear microcentrifuge tubes. The background is a blurred blue and white laboratory setting.

## Versatile

Reliable isolation of functional T cells from a variety of starting materials

## Unique

Proven column technology yields positive and negative fractions with high purity that are directly available for downstream applications

## Diverse

Choose the cell isolation option that is best for your specific requirements

# Select the best

The MACS® Cell Separation portfolio offers you the freedom to choose the cell isolation method that is best suited to your specific requirements. Our proven magnetic cell separation technology is continuously expanding to offer new and innovative options across basic and clinical research.

# T cell isolation with MACS<sup>®</sup> Technology

## autoMACS<sup>®</sup> Pro Separator

A fully automated benchtop separator for magnetic cell sorting of multiple samples.

- Automated, walk-away cell labeling and isolation for up to six samples
- Standardized cell separation for reproducible, user-independent results
- Fast and gentle isolation of virtually any cell type
- Chilled sample processing

## MultiMACS<sup>™</sup> Cell24 Separator Plus

Efficient, semi-automatic cell isolation of up to 24 samples simultaneously.

- **Time-saving:** Up to 24 separations in parallel
- **User-friendly:** Easy to operate with intuitive touchscreen interface
- **Adaptable:** Use with single columns or column blocks

	MiniMACS <sup>™</sup> Separator	OctoMACS <sup>™</sup> Separator	MidiMACS <sup>™</sup> Separator	QuadroMACS <sup>™</sup> Separator	MACS <sup>®</sup> Express Separator	autoMACS <sup>®</sup> Pro Separator	MultiMACS <sup>™</sup> Cell24 Separator Plus
							
<b>Columns</b>	MS Columns, Large Cell Columns	MS Columns, Large Cell Columns	LS Columns, LD Columns, Whole Blood Columns	LS Columns, LD Columns, Whole Blood Columns	n/a	autoMACS Columns	Multi-24 Column Block, LS Columns*, LD Columns*, Whole Blood Columns*
<b>Capacity, number of total cells</b>	MS: $2 \times 10^8$ Large Cell: $2 \times 10^8$	MS: $2 \times 10^8$ Large Cell: $2 \times 10^8$	LS: $2 \times 10^9$ LD: $5 \times 10^8$ Whole blood: up to 15 mL blood	LS: $2 \times 10^9$ LD: $5 \times 10^8$ Whole blood: up to 15 mL blood	Up to 30 mL whole blood	$4 \times 10^9$ cells or 15 mL whole blood	Multi-24 Column Block: $1 \times 10^9$ LS: $2 \times 10^9$ LD: $5 \times 10^8$ Whole blood columns: 10 mL whole blood
<b>Capacity, number of labeled cells</b>	MS: $1 \times 10^7$ Large Cell: $1 \times 10^7$	MS: $1 \times 10^7$ Large Cell: $1 \times 10^7$	LS: $1 \times 10^8$ LD: $1 \times 10^8$	LS: $1 \times 10^8$ LD: $1 \times 10^8$	n/a	$2 \times 10^8$ cells	LS: $1 \times 10^8$ LD: $1 \times 10^8$ Multi-24 Column Block: $1 \times 10^8$

\*with Single-Column Adapter

**Table 1:** An overview of MACS Separators and Columns.

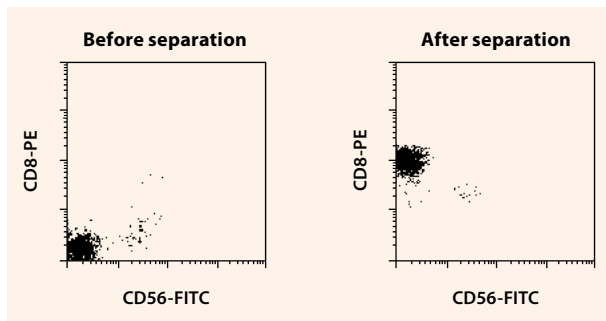
# Isolate virtually any T cell subset

Isolate T cell subsets from human, mouse, rat, and non-human primate samples. Choose from our extensive portfolio for the isolation of virtually any T cell subset. You can find our available portfolio of products on pages 24–26.

## MACS® MicroBeads and MicroBead Kits

Straightforward positive selection of your T cell subset of choice directly via the respective markers making it ideal for rare cells and single cell suspensions. Highest purity and recovery as simple as it gets.

- Minimal cell labeling – no cell activation
- Ideal for rare cells, challenging samples and tissue single cell suspensions
- Proven technology for basic research and clinical application

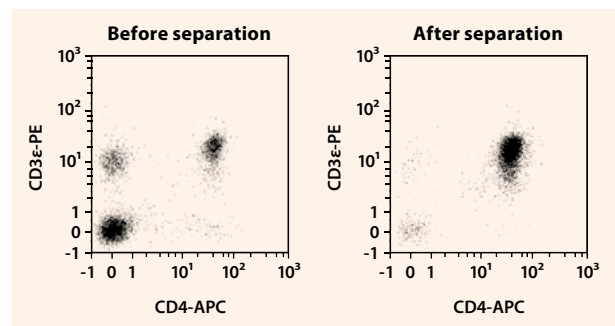


**Figure 1:** Enrichment of CD8<sup>+</sup> T cells from human PBMCs using CD8 MicroBeads, human. Cells were stained with CD8-PE and CD56-FITC and analyzed using the MACSQuant Analyzer.

## MACS® T Cell Isolation Kits

Remove any unwanted cells from the target population by depletion when untouched cell separation or subsequent magnetic sorting steps are required. Ideal for PBMC samples and mouse spleen single cell suspensions.

- Untouched selection by depletion of non-target cells
- Ideal for pre-enrichments (e.g. CD4<sup>+</sup> cell isolation prior to flow sorting of Treg cells)



**Figure 2:** Untouched isolation of CD4<sup>+</sup> T cells from a mouse spleen using the CD4<sup>+</sup> T Cell Isolation Kit, mouse. The spleen single-cell suspension was prepared with the gentleMACS Dissociator. Cells were stained with CD4-APC and CD3ε-PE antibodies and analyzed using the MACSQuant Analyzer.

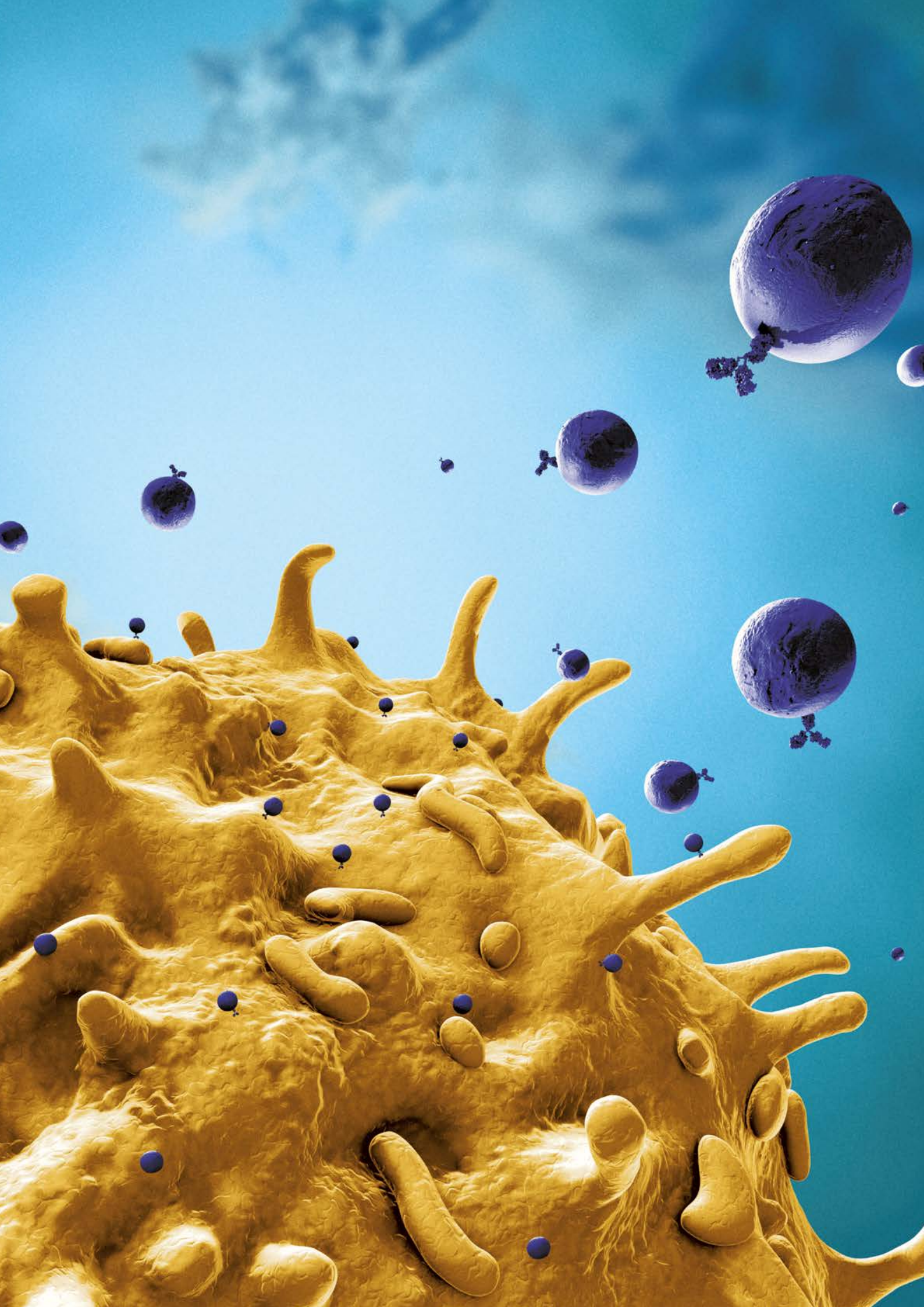
VIDEO



Learn more about the principle of our MACS® Technology:

► [miltenyibiotec.com/MACScellsep](https://miltenyibiotec.com/MACScellsep)



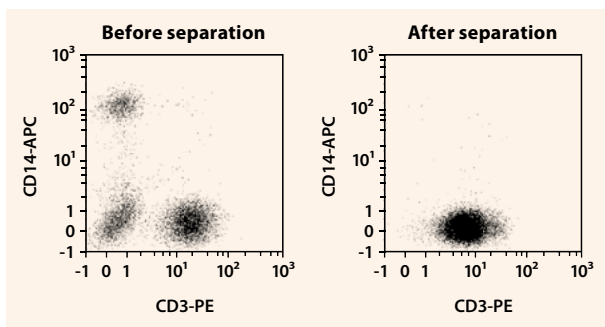


# Isolate T cells directly from whole blood and blood products

## StraightFrom<sup>®</sup> MicroBeads

Positive selection of pan T cells, CD4<sup>+</sup> or CD8<sup>+</sup> cell subsets without density gradient centrifugation. Effortless, simple, and automatable.

- Highly pure cells straight from whole blood, buffy coat, LRSC, and Leukopak<sup>®</sup>
- No density gradient centrifugation or erythrocyte lysis needed
- Easy and fast protocols – process a full buffy coat or half Leukopak in only 30 minutes

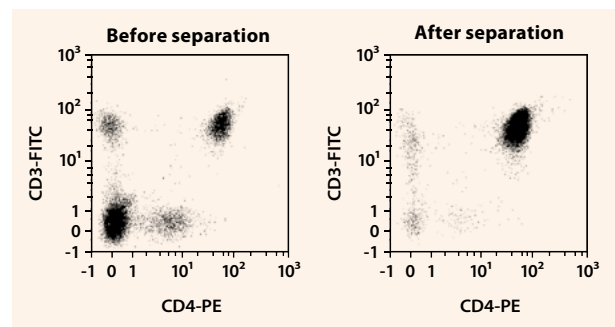


**Figure 3:** Separation of CD3<sup>+</sup> T cells from whole blood using StraightFrom Whole Blood CD3 MicroBeads, human and the MultiMACS Cell24 Separator.

## MACSxpress<sup>®</sup> Isolation Kits

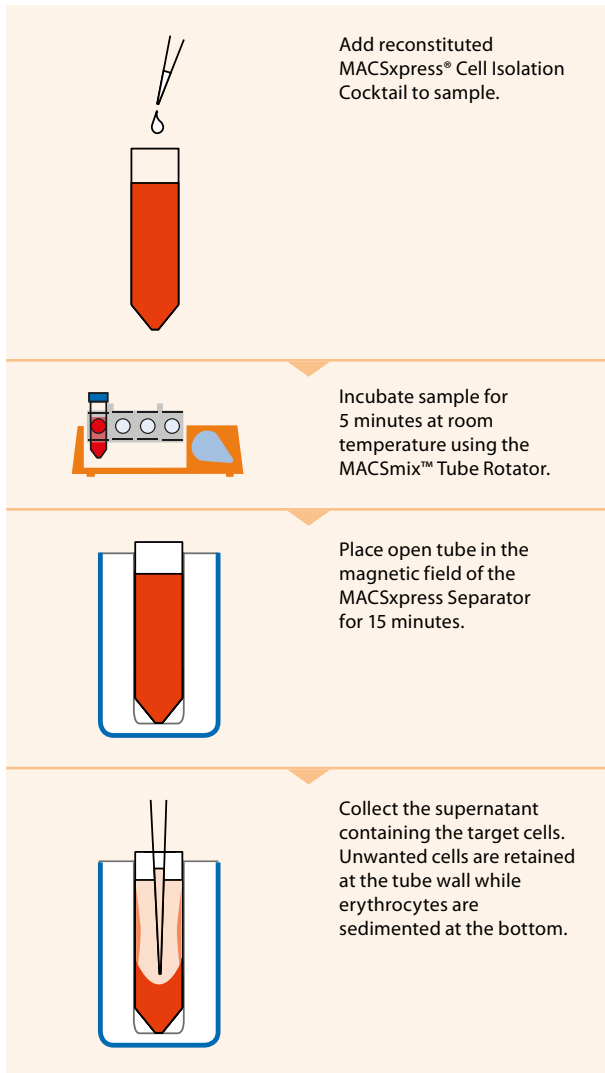
Fast and easy untouched isolation of pan T cells and several subsets directly from human whole blood, buffy coat or LRSC.

- Obtain pure cells in only 25 minutes
- No density gradient centrifugation
- Column-free system



**Figure 4:** CD4<sup>+</sup> T cells were isolated from whole blood using the MACSxpress Whole Blood CD4 T Cell Isolation Kit, MACSmix Tube Rotator, and MACSxpress Separator.

## The principle of MACSpress® Technology



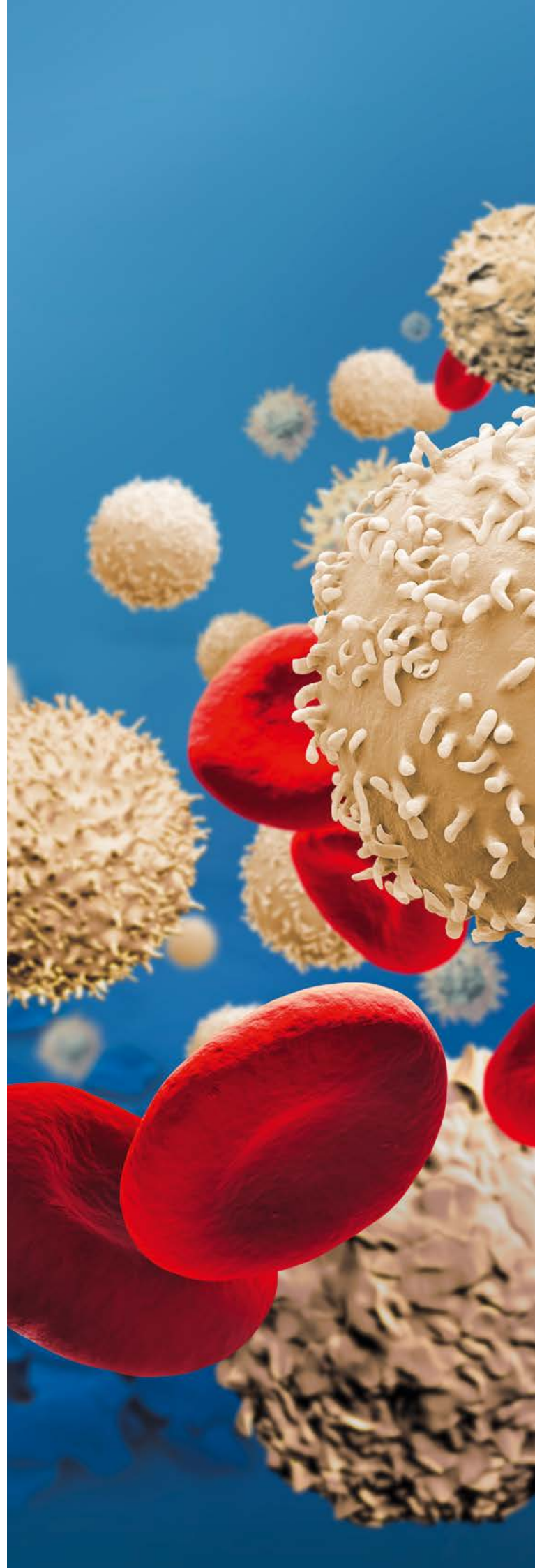
**Figure 5:** Principle of MACSpress Technology. Isolation of cells directly from blood and blood products in only 25 minutes.

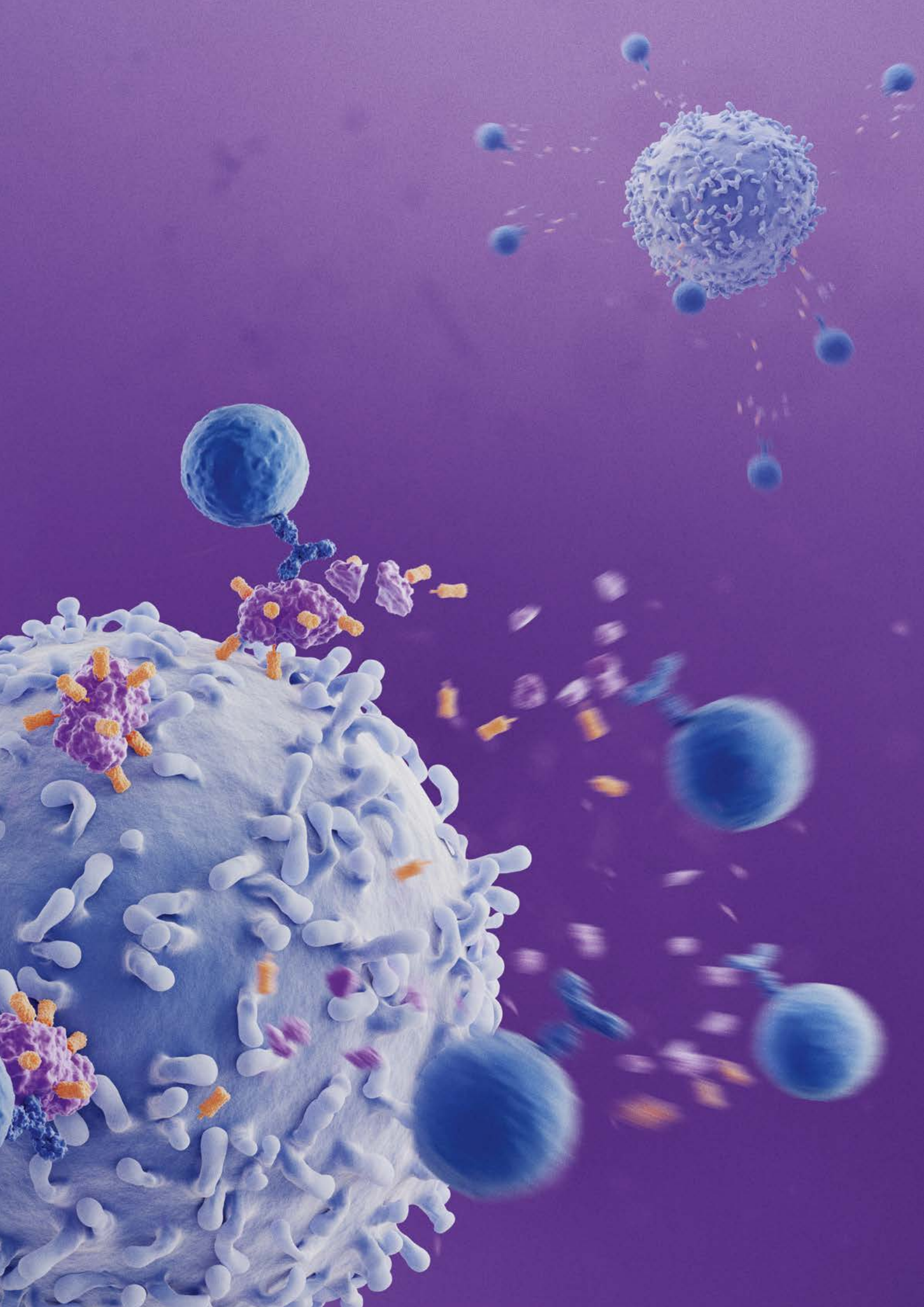
VIDEO



Watch our video to learn how to skip density centrifugation:

▶ [miltenyibiotec.com/StraightFromMB](https://miltenyibiotec.com/StraightFromMB)



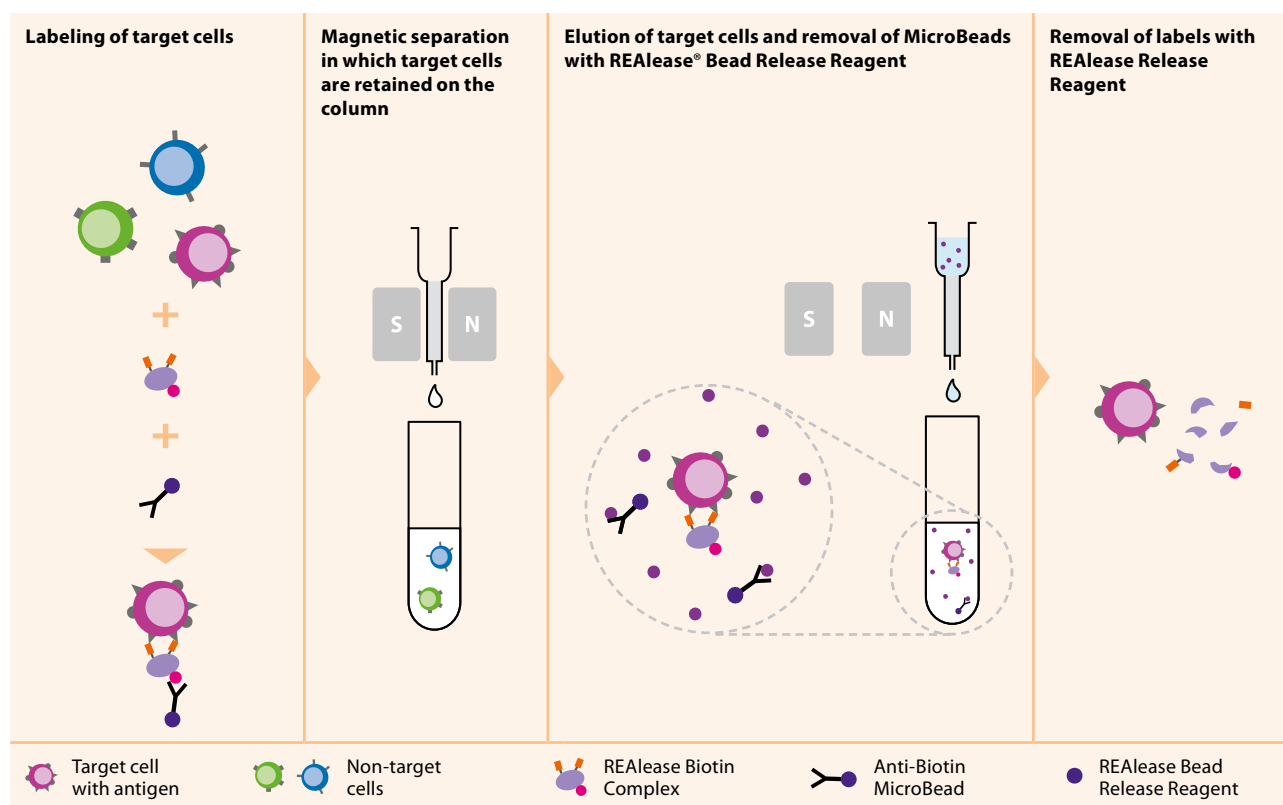


# Label-free T cell isolation with REAlease® Technology

Isolate label-free pan T cells and subsets from a variety of human and mouse starting materials. REAlease® Technology allows for magnetic cell isolation with subsequent removal of any beads and labels from your cells of interest. Enriched cells are then suitable for magnetic re-labeling and any application where label-free cells are essential.

## REAlease® MicroBeads

- Bead-free cells suited for a second round of positive selection
- Label-free cells for any downstream application
- Recombinant antibody fragments for reproducible results



**Figure 6:** The basic principle of REAlease MicroBeads for reversible cell labeling.

**REA**  
lease

VIDEO



Want to learn more? Watch this short video to learn the basics of reversible cell labeling using REAlease MicroBeads.

► [miltenyibiotec.com/REAleaseMB](https://miltenyibiotec.com/REAleaseMB)



### Entire workflow

Optimized cell culture reagents to support complete experimental workflows

### Standardization

Reproducible and reliable results are key for success

### Cell therapy

Products are available up to MACS® GMP grade

# Culture is key

Consistent, high-quality products are essential for reliable and valid results. At Miltenyi Biotec, we offer an extensive T cell culture portfolio including specialized media, recombinant cytokines and growth factors, as well polyclonal and antigen-specific activation reagents.

# Optimal T cell culture conditions

## TexMACS™ Medium

Optimized cell culture media developed for high-performance cultivation of human and mouse T cells. Achieve optimal cell growth, high expansion rates, and reliable activation – even without serum.

## MACS® Premium-Grade Cytokines

Designed for demanding cell culture applications in all areas of T cell research. Save time and costs whilst achieving consistent results.

- **Reproducible results:** lot-specific activity in IU and highest quality testing using WHO standards
- **Save time and costs:** no lot-to-lot testing required, efficient dosage without oversaturation
- **Easy translation:** low endotoxin levels, high purity and available up to MACS® GMP grade for all relevant pre-clinical studies

## T cell differentiation

Our portfolio offers a large range of T cell-relevant cytokines, growth factors and functional-grade antibodies to provide the best tools for your T cell differentiation.

VISIT



### CytoBox – Differentiation of mouse T helper cells

All-in-one kit with everything you need for efficient Th1, Th2, and Th17 differentiation of mouse naive CD4<sup>+</sup> T cells, including cytokines and functional-grade antibodies.

► [miltenyibiotec.com/cytobox](https://miltenyibiotec.com/cytobox)

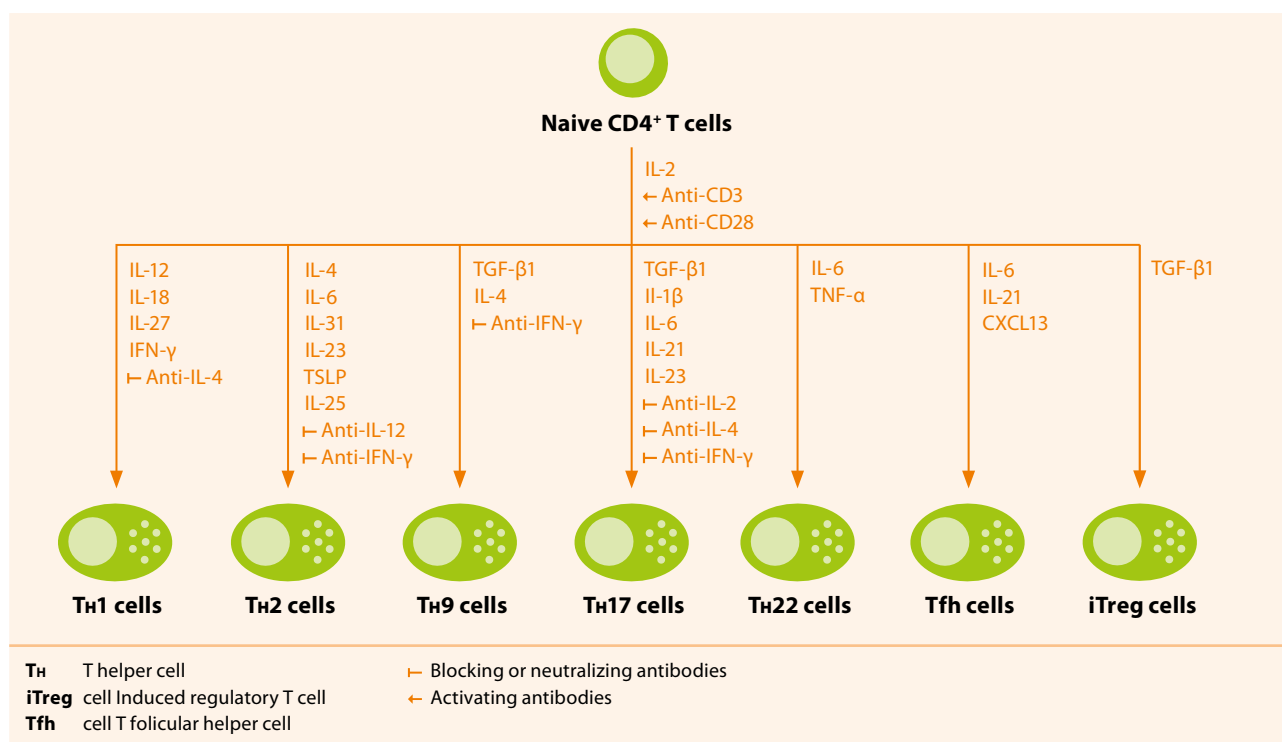


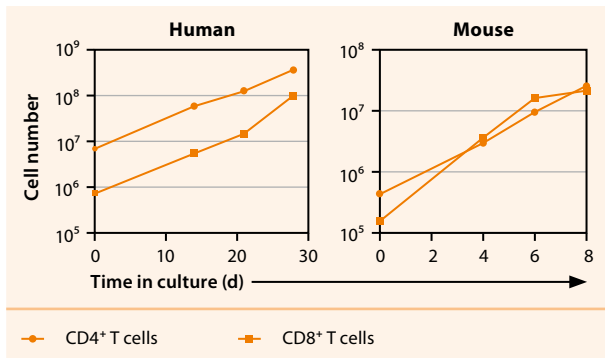
Figure 7: Differentiation and activation of CD4<sup>+</sup> T cell subsets.

# Efficient T cell activation and expansion

## T cell activation and expansion kits

MACSiBead™ particles loaded with functional antibodies resemble antigen-presenting cells, mimicking cell-mediated T cell stimulation and expansion.

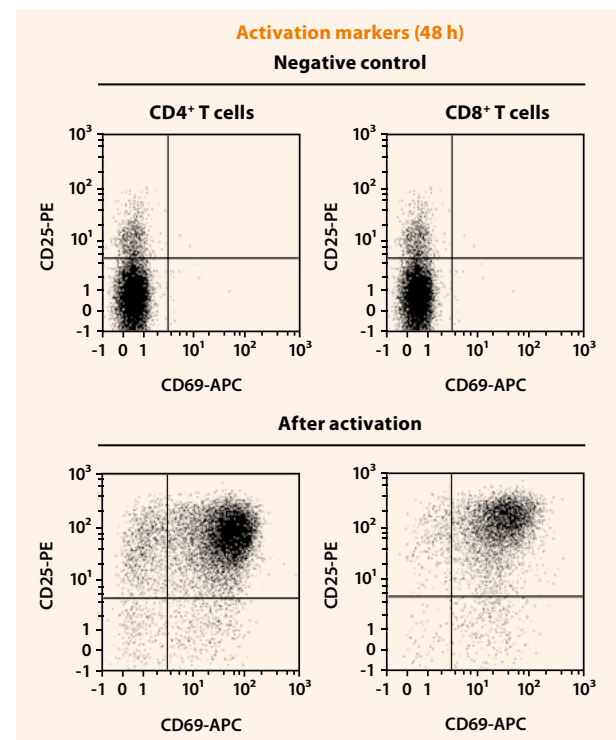
- Highly efficient and homogenous polyclonal T cell stimulation for optimal expansion
- Flexible loading with antibodies of your choice
- Specific kits for human and mouse T cells and Treg cells



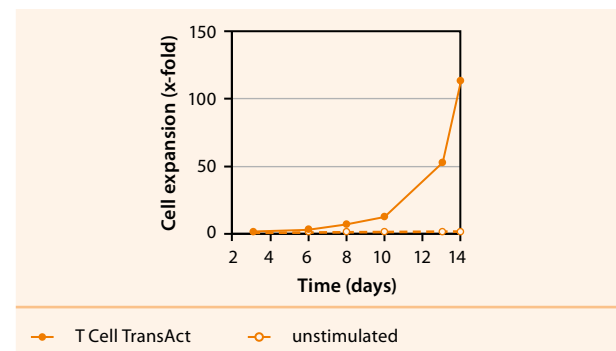
**Figure 8:** Expansion of human and mouse CD4<sup>+</sup> and CD8<sup>+</sup> T cells using the respective T Cell Activation/Expansion Kit.

## T Cell TransAct™

T Cell TransAct™ is an innovative colloidal, polymeric nanomatrix, conjugated to humanized, recombinant CD3 and CD28 agonists for physiological T cell activation and expansion.



**Figure 9:** Activation and expansion of human CD4<sup>+</sup> and CD8<sup>+</sup> T cells using T Cell TransAct and TexMACS Medium. T cells were isolated using the Pan T Cell Isolation Kit, human, cultured in TexMACS Medium containing MACS Premium-Grade Cytokine IL-2 and stimulated with T Cell TransAct. After 48 hours of activation, CD25 and CD69 activation marker expression was analyzed using the MACSQuant Analyzer.



**Figure 10:** T cells activated with T Cell TransAct, human showed a strong proliferation during 14 days of culture. Proliferation was measured using the cell division tracker CFSE.



# T Cell TransAct™

The next generation T cell activation reagent



## Practical application

- Volumetric dosage
- Ready-to-use
- Removal by simple wash step



## Robust stimulation

- Effector phenotype
- Highest cell viability
- Physiological and stable stimulation



## Convenient compatibility

- Available for research and GMP workflows
- Optimized for CAR T production on the CliniMACS Prodigy®
- Can be sterile filtered

VIDEO



Can't get enough of your T cells?  
Watch the video to learn more:

► [miltenyibiotec.com/TCellTransAct](https://miltenyibiotec.com/TCellTransAct)

# Antigen-specific and polyclonal T cell stimulation

## PepTivator® Peptide Pools

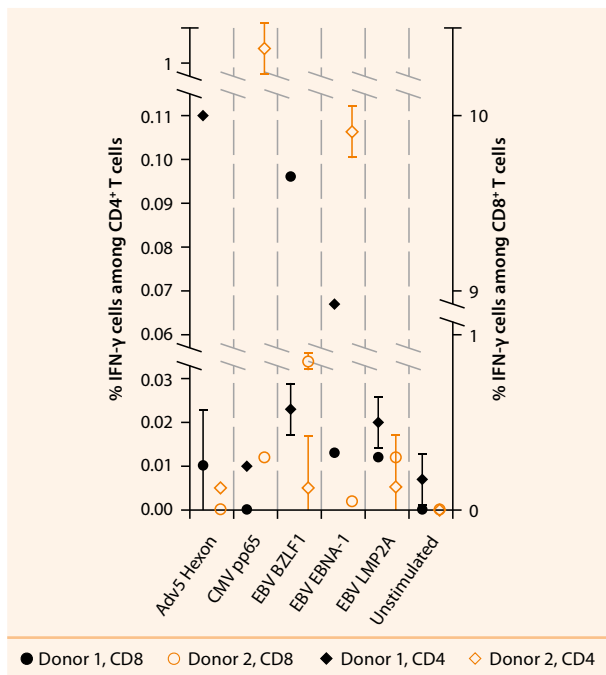
Effective stimulation of antigen-specific T cells is achieved consistently with PepTivator® Peptide Pools. These extensive panels of virus-, tumor-, microbiota-, and auto-antigen-specific antigens consists of 15-mer peptides with 11-amino-acid overlaps, covering the complete sequence of the respective antigen.

- Fast and efficient antigen-specific stimulation of CD4<sup>+</sup> and CD8<sup>+</sup> T cells
- Pulsing of antigen-presenting cells such as dendritic cells
- Water soluble and no need for toxic DMSO
- In a convenient 96-well format
- Available up to MACS® GMP grade

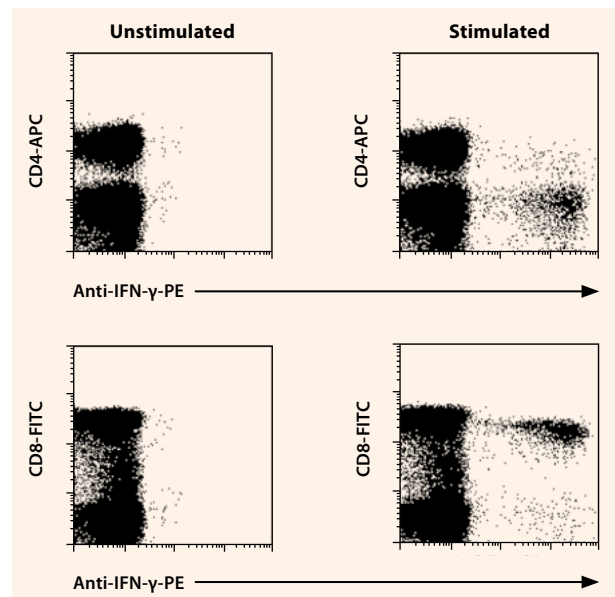
## Functional-grade antibodies

Our functional-grade antibodies can be used for activation, neutralizing or blocking studies, both *in vitro* or *in vivo*. Mimic or inhibit ligand-receptor interactions for the activation and expansion of human and mouse T cells. Obtain reliable results from high quality antibodies.

- Free of preservatives, sterile filtered, with low endotoxin content
- Suited for activation, neutralization, or blocking assays
- Pure (e.g. CD3 pure, CD28 pure) or biotinylated
- Available up to MACS GMP grade



**Figure 11:** Production of IFN- $\gamma$  by human CD4<sup>+</sup> or CD8<sup>+</sup> T cells after stimulation with different antigens using PepTivator Peptide Pools.

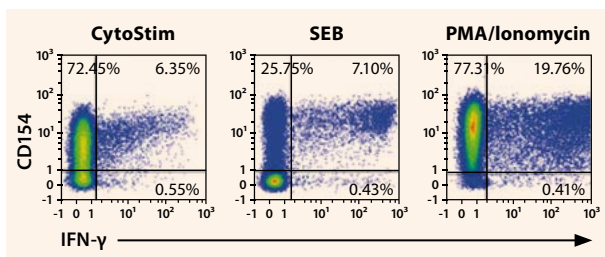


**Figure 12:** Restimulation of human PBMCs with and without PepTivator CMV pp65 – premium grade. For flow cytometry analysis cells were subsequently stained with anti-IFN- $\gamma$ -PE (intracellular cytokine staining) and counterstained for CD4 and CD8 expression.

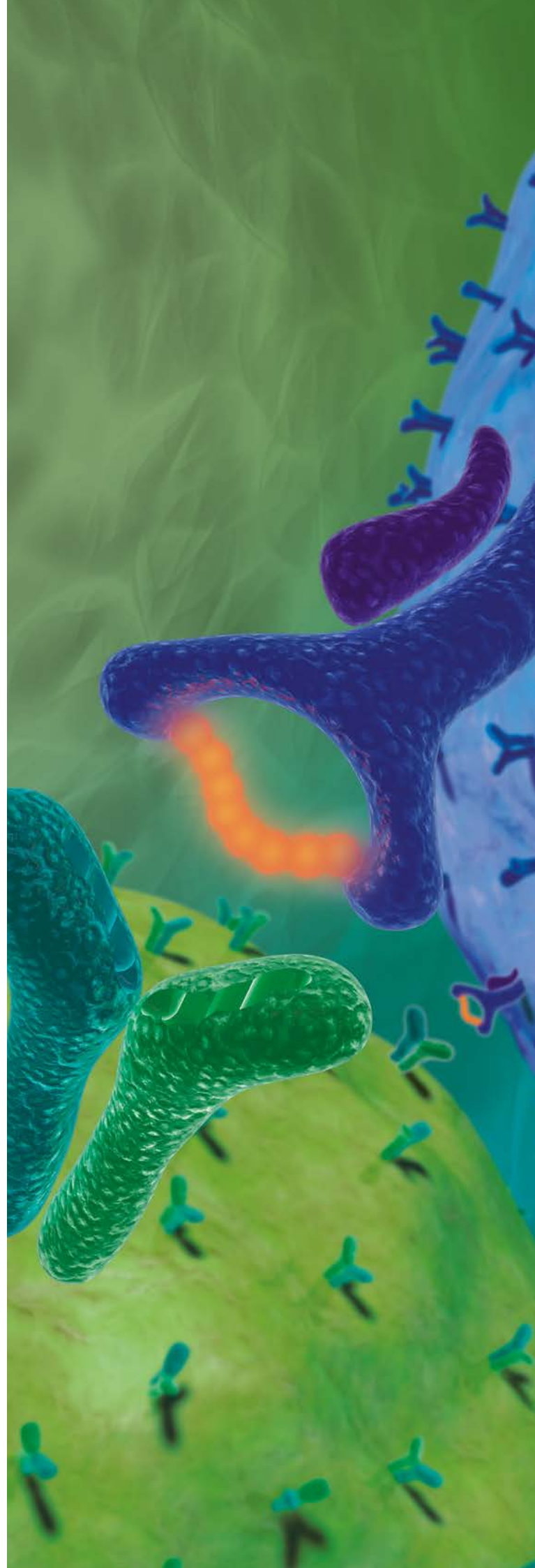
## CytoStim™

The non-toxic alternative to the superantigen SEB, CytoStim™, has been developed for rapid and effective restimulation of effector and memory T cells. It works by cross-linking the T cell receptor to the antigen-presenting cell of the major histocompatibility complex (MHC) molecule. Alike SEB, it results in rapid cytokine expression upon stimulation and is consequently suited as a positive control for T cell stimulation experiments.

- Rapid cytokine expression and upregulation of activation markers by target cells
- Antibody-based, non-toxic alternative to SEB
- Suitable for CD4<sup>+</sup> and CD8<sup>+</sup> T cells in fresh PBMCs, whole blood, or other single cell suspensions



**Figure 13:** PBMCs were isolated via density gradient centrifugation and stimulated with the CytoStim Reagent, SEB, or PMA/Ionomycin (positive control) for comparison of T cell activation. Responding T cells were analyzed according to their expression of CD4 and CD8, activation marker CD154 and secretion of IFN-γ using the MACSQuant Analyzer. CytoStim activated cells show higher expression of activation marker CD154, while the expression of IFN-γ is similar compared to cells stimulated with SEB.





## High-throughput

MACSQuant® Flow Cytometers and the Tyto® Cell Sorter for high throughput multiparameter cell analysis and sorting

## Revolutionary

High purity, low background and lot-to-lot consistency with REAfinity™ Recombinant Antibodies

## Flexible

Flow analysis kits for fast, easy and automated multiparameter flow analysis

# Join the flow revolution

The flow cytometry and cell sorting portfolio offers the best-in-class solutions for all of your T cell research needs. Our flow analysis tools lead you one step closer to reliable and reproducible results every time.

# Flow cytometry and cell sorting solutions to power your T cell research

## MACSQuant® Flow Cytometers

Fully automated, reliable high-throughput screening for sensitive, multiparameter cell analysis.

- **MACSQuant® Analyzer 10:** Three lasers (blue, violet, red) and ten optical parameters
- **MACSQuant Analyzer 16:** Expanded fluorescent channels with 16 optical parameters
- **MACSQuant VYB:** Unique variant with a yellow laser for optimized detection of “fruit” fluorescent proteins
- **MACSQuant X:** Compact flow cytometer for fast and reliable processing of 96- and 384-well plates



## MACSQuant® Tyto® Cell Sorter

Revolutionary cell sorting based on microchip technology for high-speed, multiparameter flow sorting.

- Gentle to cells: Microchip-based sorting process
- Safe: Closed and sterile cartridge system, no contamination or sample carry over, no internal fluidics
- Flow sorting based on up to 10 parameters
- Benchtop instrument
- MACS® GMP consumables for simple transfer from RUO to GMP protocols



Learn more about our  
MACSQuant® Instruments:  
► [miltenyibiotec.com/TCellFlow](https://miltenyibiotec.com/TCellFlow)

VISIT 

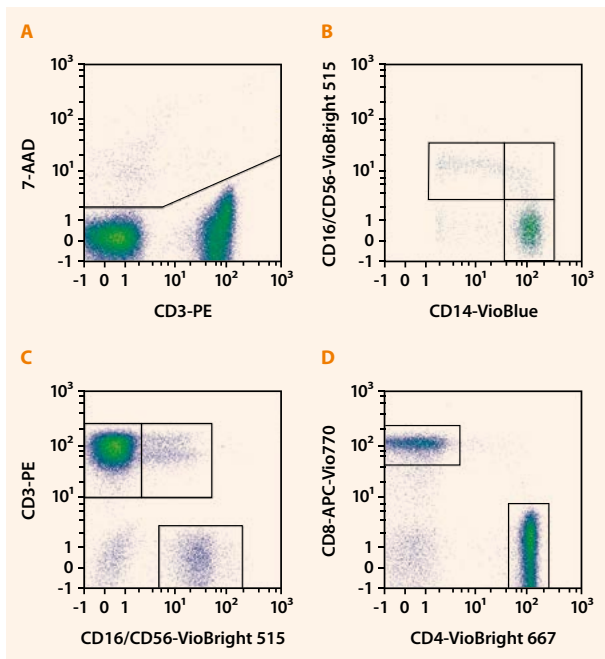
# Enhance your T cell analysis

Flow cytometry is the method of choice to monitor phenotype, plasticity and functionality of T cells. Our portfolio of flow cytometry products provides high quality reagents and instruments to support quick, easy and standardized multi-parameter T cell analysis generating reliable and consistent data.

## 8-Color Immunophenotyping Kit

Simplified immunophenotyping of PBMCs, whole blood, lysed whole blood, and other single-cell suspensions from tissue.

- Reliable and reproducible analysis of multiple leukocyte subsets
- Ready-to-use antibody cocktail with optimized concentrations
- Fully automated measurement and analysis via Express Mode with MACSQuant® Analyzers



**Figure 14:** Whole blood staining with the 8-Color Immunophenotyping Kit, human and flow cytometry cell analysis using the MACSQuant Analyzer 10. A gate around viable cells was set for elimination of doublets (A). Monocytes were differentiated based on their CD14 expression and further divided into classical, intermediate, and non-classical monocytes via CD16 (B). CD3 and CD56 were used to distinguish CD56<sup>+</sup> NK cells, CD3<sup>+</sup> T cells and a CD3<sup>+</sup> CD56<sup>+</sup> T cell population (C). The CD3<sup>+</sup> T cells were divided into CD4<sup>+</sup> and CD8<sup>+</sup> T cells (D).

## Rapid Cytokine Inspector Kits

Our Rapid Cytokine Inspector Kits are optimized for fast, high-throughput, multi-parameter analysis of activated cytokine secreting human T cells. These all-in-one kits combine extracellular marker staining with intracellular cytokine detection.

- High-throughput multi-parameter analysis of antigen-specific T cells
- Rapid identification and enumeration of cytokine-producing activated antigen-specific CD4<sup>+</sup> and CD8<sup>+</sup> T cells
- Immunomonitoring of antigen-specific T cells

Fluorochrome	CD4/CD8 T Cell Detection Cocktail	CD4 T Cell Detection Cocktail	CD8 T Cell Detection Cocktail
VioBlue®	CD3	CD3	CD3
FITC	CD8	CD154	CD8
PE	Cytokine 1	Cytokine 1	Cytokine 1
PerCP	CD14/CD20	CD14/CD20	CD14/CD20
APC	CD4	CD4	Cytokine 2
	FcR-Block	FcR-Block	FcR-Block

**Table 2:** Rapid Cytokine Inspector Kits combine extracellular marker staining with intracellular cytokine detection and contain everything you need for staining antigen-activated T cells. Choose the appropriate anti-cytokine antibody (e.g. IL-2, IL-17, IFN- $\gamma$ , TNF- $\alpha$ ; not provided with the kit) and start your experiment.



**Mutated Fc region**  
 Made to eliminate background signal

### MACS® Cytokine Secretion Assays

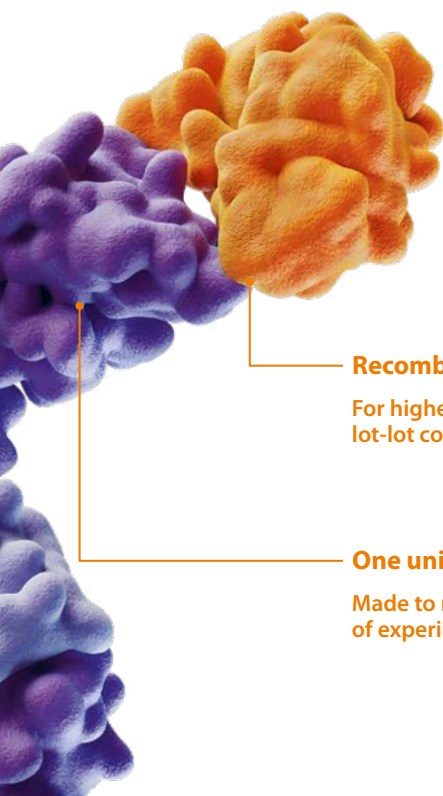
Developed for detection and enrichment of viable cytokine-secreting T cell subsets. Detection of one T cell in a million cells.

- Isolation of viable cytokine-secreting T cells
- Accurate analysis of cytokine secretion at single-cell level
- Ideal for the analysis of rare antigen-specific T cell populations
- Isolation of T cell subsets such as Th1 (IFN- $\gamma$ ), Th2 (IL-4), Th17 (IL-17), and IL-10-secreting Tr1 (IL-1) cells

### MACSPlex Cytokine Kits

Determine multiple soluble analytes in a single human or mouse sample using a standard flow cytometer.

- True multiplexing
- Up to 12 human or 10 mouse cytokines in one sample
- Optimized for automated measurement using the MACSQuant® Analyzer's Express Mode
- Dedicated kits available for analysis of exosomes, cytotoxicity and effector functions



**Recombinantly generated**  
For highest purity and lot-lot consistency

**One universal IgG1 isotype**  
Made to reduce complexity of experiment planning

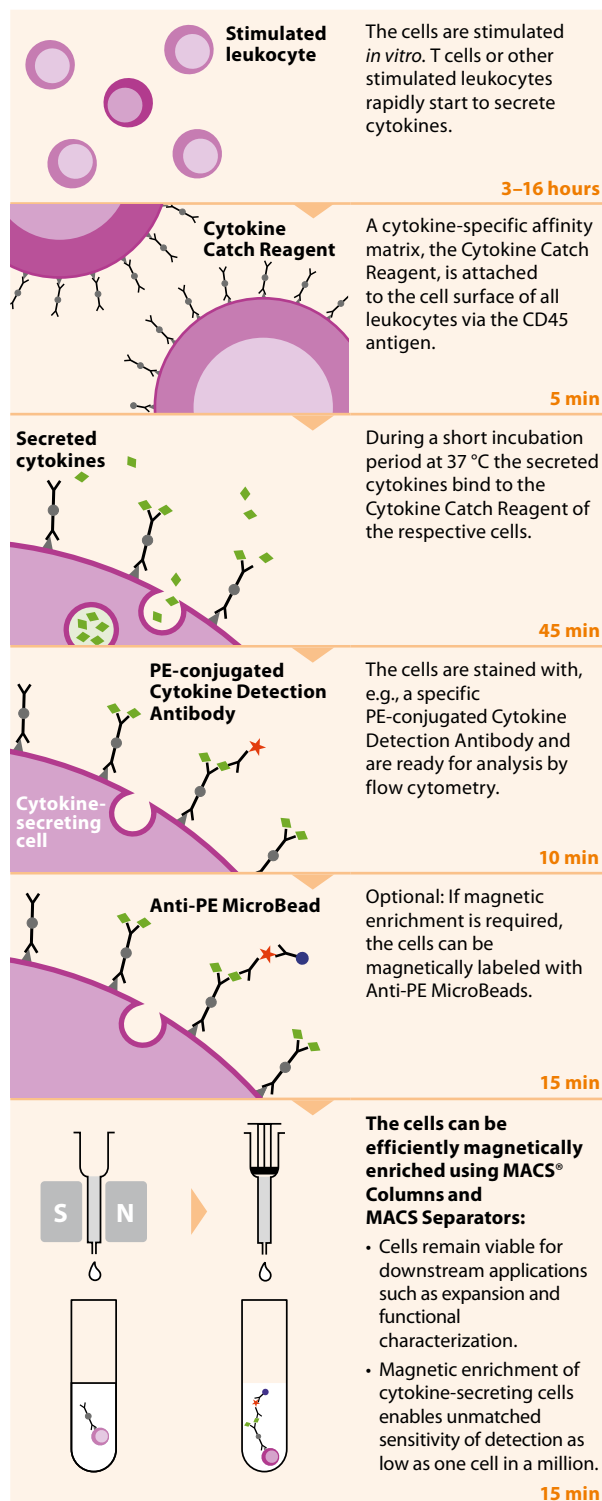


Figure 15: Principle of the Cytokine Secretion Assays.

# Human T cells

## Separation reagents



### T cells

CD2 MicroBeads  
# 130-091-114  
CD3 MicroBeads  
# 130-050-101  
REAlElease® CD3  
MicroBead Kit  
# 130-117-038  
CD6 MicroBeads  
# 130-091-264

CD28 MicroBead  
Kit # 130-093-247  
MACSxpress®  
Whole Blood Pan  
T Cell Isolation Kit,  
human  
# 130-098-193  
MACSxpress LRSC  
Pan T Cell Isolation  
Kit, human  
# 130-096-535

MACSxpress  
Buffy Coat Pan T  
Cell Isolation Kit,  
human  
# 130-120-001  
StraightFrom®  
Whole Blood CD3  
MicroBeads  
# 130-090-874

StraightFrom  
Buffy Coat CD3  
MicroBead Kit,  
human  
# 130-121-310  
StraightFrom LRSC  
CD3 MicroBead Kit,  
human  
# 130-121-309

StraightFrom  
Leukopak® CD3  
MicroBead Kit,  
human  
# 130-122-365  
StraightFrom Buffy  
Coat REAlElease CD3  
MicroBead Kit,  
human  
# 130-127-142



### DN T cells

Double-negative  
T Cell Isolation Kit  
# 130-092-614



### Naive Pan T cells

Naive Pan T Cell  
Isolation Kit  
# 130-097-095



### Activated T cells

CD25 MicroBeads II  
# 130-092-983  
CD30 MicroBeads  
# 130-051-401  
CD69 MicroBead Kit II  
# 130-092-355  
CD154 MicroBead Kit  
# 130-092-658  
CD137 MicroBead Kit  
# 130-093-476



### CD4<sup>+</sup> T cells

CD4 MicroBeads  
# 130-045-101  
REAlElease CD4  
MicroBead Kit  
# 130-117-037  
CD4<sup>+</sup> T Cell Isolation Kit  
# 130-096-533  
MACSxpress Whole  
Blood CD4 T Cell  
Isolation Kit  
# 130-098-195  
StraightFrom Buffy Coat  
CD4 MicroBead Kit  
# 130-114-980  
StraightFrom LRSC  
CD4 MicroBead Kit  
# 130-117-028  
StraightFrom Leukopak  
CD4 MicroBead Kit  
# 130-117-022  
StraightFrom Whole  
Blood CD4 MicroBeads  
# 130-090-877  
MACSxpress LRSC CD4  
T Cell Isolation Kit  
# 130-120-000  
MACSxpress Buffy Coat  
CD4 T Cell Isolation Kit  
# 130-120-003  
StraightFrom Buffy  
Coat REAlElease CD4  
MicroBead Kit, human  
# 130-127-149



### Treg cells

CD25 MicroBeads II  
# 130-092-983  
CD127 MicroBead Kit  
# 130-094-945  
CD4<sup>+</sup>CD25<sup>+</sup> Regulatory  
T Cell Isolation Kit  
# 130-091-301  
CD4<sup>+</sup>CD25<sup>+</sup>CD127<sup>dim/-</sup>  
Regulatory T Cell  
Isolation Kit II  
# 130-094-775  
CD25<sup>+</sup>CD49d<sup>-</sup> Regulatory  
T Cell Isolation Kit  
# 130-094-551  
CD4<sup>+</sup>CD25<sup>+</sup>CD45RA<sup>+</sup>  
Regulatory T Cell  
Isolation Kit  
# 130-093-631  
MACSxpress Whole Blood  
Treg Isolation Kit  
# 130-109-557



### TCRγ/δ<sup>+</sup> T cells

Anti-TCRγ/δ  
MicroBead Kit  
# 130-050-701  
TCRγ/δ<sup>+</sup> T Cell  
Isolation Kit  
# 130-092-892



### CD8<sup>+</sup> T cells

CD8 MicroBeads  
# 130-045-201  
REAlElease CD8 MicroBead Kit  
# 130-117-036  
CD8<sup>+</sup> T Cell Isolation Kit  
# 130-096-495  
MACSxpress CD8 T Cell  
Isolation Kit  
# 130-098-194  
StraightFrom Whole Blood  
CD8 MicroBeads  
# 130-090-878  
StraightFrom Buffy Coat  
CD8 MicroBead Kit  
# 130-114-978  
StraightFrom LRSC  
CD8 MicroBead Kit  
# 130-117-027  
StraightFrom Leukopak  
CD8 MicroBead Kit  
# 130-117-019  
StraightFrom Buffy Coat  
REAlElease CD8 MicroBead  
Kit, human  
# 130-127-139



### NKT cells

Anti-iNKT  
MicroBeads  
# 130-094-842  
CD3<sup>+</sup>CD56<sup>+</sup>  
NKT Cell  
Isolation Kit  
# 130-093-064



### Tumor-infiltrating leukocytes (TIL)

CD45 (TIL) MicroBeads  
# 130-118-780  
REAlElease CD45 (TIL)  
MicroBead Kit, human  
# 130-121-563  
REAlElease CD3 (TIL)  
MicroBead Kit, human,  
# 130-121-562  
REAlElease CD4 (TIL)  
MicroBead Kit, human,  
# 130-121-559  
REAlElease CD8 (TIL)  
MicroBead Kit, human,  
# 130-121-560  
REAlElease CD4/CD8 (TIL)  
MicroBead Kit, human,  
# 130-121-561



## CD4<sup>+</sup> T cell subsets



### CD4<sup>+</sup> RTE

CD4<sup>+</sup> Recent Thymic Emigrant Isolation Kit  
# 130-094-299



### Naive CD4<sup>+</sup> T cells

Naive CD4<sup>+</sup> T Cell Isolation Kit II  
# 130-094-131

*Pre-selection with:*  
CD4<sup>+</sup> T Cell Isolation Kit  
# 130-096-533

CD62L MicroBeads  
# 130-091-758

REAlase<sup>®</sup> CD62L MicroBead Kit, human,  
# 130-124-203

CD45RA MicroBeads  
# 130-045-901

CD45RO MicroBeads  
# 130-046-001



### Skin-homing T cells

Anti-CLA MicroBead Kit  
# 130-092-464

CD4<sup>+</sup>CLA<sup>+</sup> T Cell Isolation Kit  
# 130-092-435



### Memory CD4<sup>+</sup> T cells

Memory CD4<sup>+</sup> T Cell Isolation Kit  
# 130-091-893

MACSxpress<sup>®</sup> Whole Blood CD4 Memory T Cell Isolation Kit, human  
# 130-106-770



### TEM

CD4<sup>+</sup> Effector Memory T Cell Isolation Kit  
# 130-094-125



### Tcm

CD4<sup>+</sup> Central Memory T Cell Isolation Kit  
# 130-094-302



### Th1 cells

IFN-γ Secretion Assay – Cell Enrichment and Detection Kit (PE)  
# 130-054-201



### Th2 cells

CD294 (CRTH2) MicroBead Kit  
# 130-091-274

IL-4 Secretion Assay – Cell Enrichment and Detection Kit (PE)  
# 130-054-101



### Th17 cells

IL-17 Secretion Assay – Cell Enrichment and Detection Kit (PE)  
# 130-094-542



### Th22 cells

IL-22 Secretion Assay – Cell Enrichment and Detection Kit (PE)  
# 130-108-274

## CD8<sup>+</sup> T cell subsets



### Naive CD8<sup>+</sup> T cells

Naive CD8<sup>+</sup> T Cell Isolation Kit  
# 130-093-244

*Pre-selection with:*  
CD8<sup>+</sup> T Cell Isolation Kit  
# 130-096-495

CD45RA MicroBeads  
# 130-045-901

CD45RO MicroBeads  
# 130-046-001



### Memory CD8<sup>+</sup> T cells

CD8<sup>+</sup> Memory T Cell Isolation Kit  
# 130-094-412



### TEMRA

CD8<sup>+</sup>CD45RA<sup>+</sup> Effector T Cell Isolation Kit  
# 130-094-485



### Cytotoxic T cells

CD8<sup>+</sup>CD57<sup>+</sup> T Cell Isolation Kit  
# 130-093-396



### Effector T cells

Pre-selection of CD8<sup>+</sup> T cells with:  
CD8<sup>+</sup> T Cell Isolation Kit  
# 130-096-495

CD27 MicroBeads  
# 130-051-601

## Color code for the use of MACS<sup>®</sup> Cell Separation products

- Positive selection (labeling of target cells)
- Depletion (labeling for removal of an unwanted cell type)
- Isolation of untouched cells using a depletion cocktail
- Positive selection of cells directly from blood products
- Sequential separation (combination of depletion of non-target cells and positive selection)

## Legend

- DN T cell** Double-negative T cell
- iNKT** Invariant natural killer T cell
- NKT cell** Natural killer T cell
- RTE** Recent thymic emigrant
- Tcm** Central memory T cell
- TEM** Effector memory T cell
- TEMRA** Effector memory CD45RA<sup>+</sup> T cell
- Th cell** T helper cell
- Treg cell** Regulatory T cell
- Tcr** T cell receptor

For rat and non-human primate cell isolation products, visit [www.miltenyibiotec.com/cellseparation](http://www.miltenyibiotec.com/cellseparation)  
Our T cell separation portfolio is continuously growing. Please check our website for new products and updates.

# Mouse T cells

## Separation reagents



### T cells

CD3 $\epsilon$  MicroBead Kit  
# 130-094-973  
CD90.1 MicroBeads  
# 130-121-273  
CD90.2 MicroBeads  
# 130-121-278

CD5 (Ly-1) MicroBeads  
# 130-049-301  
Pan T Cell Isolation Kit II  
# 130-095-130

REAl ease<sup>®</sup> CD90.1  
MicroBead Kit  
# 130-126-704  
REAl ease CD90.2  
MicroBead Kit  
# 130-126-706



### Naive CD4<sup>+</sup> T cells

Naive CD4<sup>+</sup> T Cell  
Isolation Kit  
# 130-104-453  
CD4<sup>+</sup>CD62L<sup>+</sup>  
T Cell Isolation Kit  
# 130-106-643



### CD4<sup>+</sup> T cells

CD4 (L3T4) MicroBeads  
# 130-117-043  
CD4<sup>+</sup> T Cell Isolation Kit  
# 130-104-454



### Treg cells

CD4<sup>+</sup>CD25<sup>+</sup> Regulatory  
T Cell Isolation Kit  
# 130-091-041  
CD25 MicroBead Kit  
# 130-091-072  
CD62L (L-selectin)  
MicroBeads  
# 130-049-701



### CD8<sup>+</sup> T cells

CD8a (Ly-2) MicroBeads  
# 130-117-044  
CD8a<sup>+</sup> T Cell Isolation Kit  
# 130-104-075  
REAl ease CD8a  
MicroBead Kit  
# 130-126-707



### TCR $\gamma/\delta$ <sup>+</sup> T cells

TCR $\gamma/\delta$ <sup>+</sup> T Cell  
Isolation Kit  
# 130-092-125



### iNKT cells

NK1.1<sup>+</sup> iNKT Cell  
Isolation Kit  
# 130-096-513



### TH1 cells

Mouse IFN- $\gamma$  Secretion  
Assay – Cell Enrichment  
and Detection Kit (PE)  
# 130-090-517



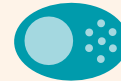
### Naive CD8a<sup>+</sup> T cells

Naive CD8a<sup>+</sup> T Cell  
Isolation Kit  
# 130-096-543



### Memory T cells

Pre-selection with:  
CD4<sup>+</sup> or CD8<sup>+</sup> T Cell Isolation Kit  
# 130-104-454 (CD4)  
# 130-104-075 (CD8)  
CD62L (L-selectin) MicroBeads  
# 130-049-701  
CD62L (L-selectin) MicroBeads  
# 130-049-701



### Activated T cells

CD25 MicroBead Kit  
# 130-091-072  
CD154 Enrichment  
and Detection Kit (PE)  
# 130-093-129



### TH2 cells

Mouse IL-4 Secretion  
Assay – Cell Enrichment  
and Detection Kit (PE)  
# 130-090-515



### TH17 cells

Mouse IL-17 Secretion  
Assay – Cell Enrichment  
and Detection Kit (PE)  
# 130-094-213



### Tumor-infiltrating leukocytes (TIL)

CD4 (TIL) MicroBeads  
# 130-116-475  
CD8 (TIL) MicroBeads  
# 130-116-478  
CD4/ CD8 (TIL) MicroBeads  
# 130-116-480  
CD45 (TIL) MicroBeads  
# 130-110-618

The coherent legend can be found on page 25

For rat and non-human primate cell isolation products, visit [www.miltenyibiotec.com/cellseparation](http://www.miltenyibiotec.com/cellseparation)  
Our T cell separation portfolio is continuously growing. Please check our website for new products and updates.

# Visit our webpage for our complete T cell product portfolio and scientific resources

- Webinars
- Videos
- Protocols and workflows
- Application notes
- Posters
- and more ...

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