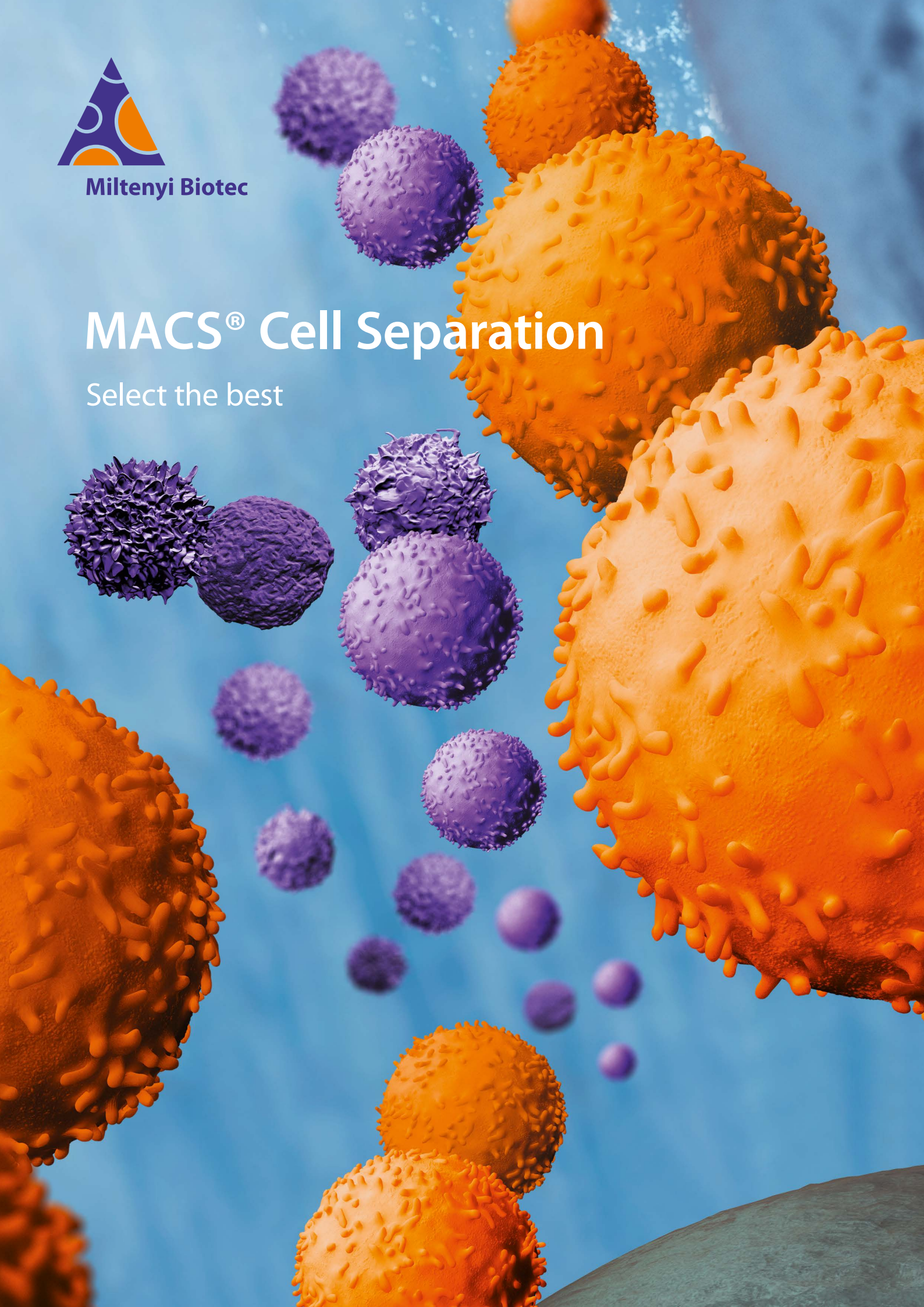
Miltenyi Biotec

MACS® Cell Separation

Select the best



MACS Technology

One portfolio for all your cell isolation needs

MACS Technology facilitates the magnetic separation of cell populations, based on surface antigens. This fast and gentle method allows the isolation of viable and functional cells by labeling epitopes with specific antibodies attached to magnetic beads.

The MACS Technology portfolio offers a diverse array of options for isolating virtually any cell type. This provides you with the flexibility to select the best cell isolation method that suits your cells and specific requirements. Our portfolio ensures consistent and reliable cell separation solutions spanning from basic to translational research and clinical applications. Supporting research at every level, MACS Technology provides the assurance that you have the best tools for isolating the exact cells you desire.

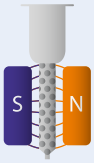
Single-cell suspensions

PBMCs, dissociated tissues (incl. tumors)

Positive selection

MACS MicroBeads
- Columns
- Nano-sized MicroBeads
- UltraPure and REAlease® MicroBeads

Negative isolation

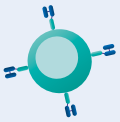


MACS Cell Isolation Kits
- Columns
- Nano-sized MicroBeads

Blood and tissue products

Whole blood, buffy coat, apheresis products

Positive selection



StraightFrom® MicroBeads
- Columns
- Nano-sized MicroBeads

Negative isolation

MACSxpress® Beads
- Column-free
- Micro-sized MACSxpress Beads

StraightFrom® Isolation Kits
- Columns
- Nano-sized MicroBeads

Contents

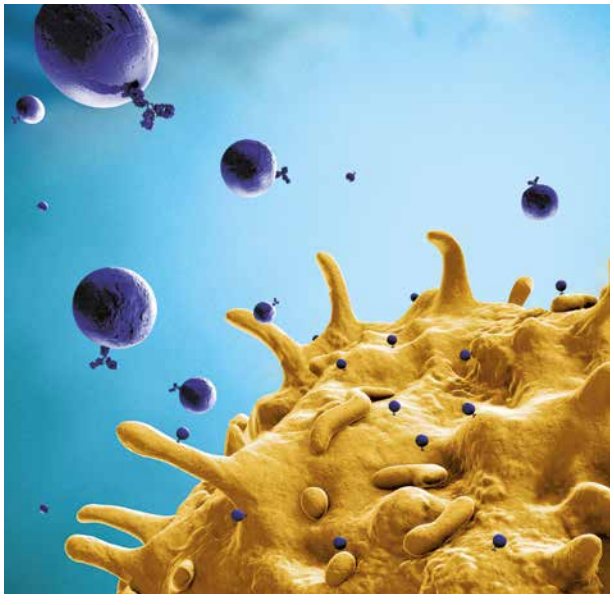
MACS MicroBeads – proven technology for basic research and clinical applications

MACS MicroBeads are nano-sized beads conjugated to highly specific antibodies, enabling gentle cell isolation with minimal labeling. These non-toxic, biodegradable MicroBeads are the smallest beads available on the market, and fully compatible with downstream applications from basic to clinical research.

- MACS MicroBeads provides the most flexible and proven method for cell separation.
- Minimal cell labeling with these nano-sized MicroBeads guarantees preserving cellular integrity and characteristics.

The success and reliability of MACS MicroBead Technology is due to the combination of nano-sized magnetic beads and a strong magnetic field within our MACS Columns. This technology ensures minimal labeling of target cells while preserving cellular properties.

Cell separation with MACS MicroBeads invovles three easy, straight-forward steps: magnetic labeling, magnetic separation, and elution of labeled cells (fig. 1).



LEARN MORE

For more information on MACS MicroBeads please visit

▸ **miltenyibiotec.com/microbeads**

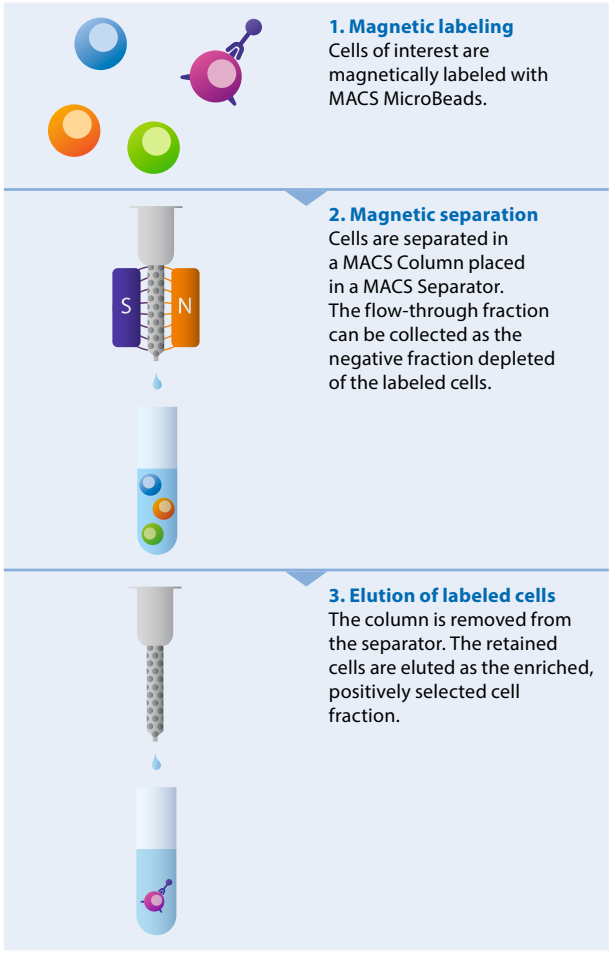


Figure 1: It only takes three easy steps to get viable cells with high yield and purity from your sample.

VIDEO

Watch how to isolate cells in three easy steps at

▸ **miltenyibiotec.com/cellseparation**

MACS Columns – minimal cell labeling with maximal magnetic power

MACS Columns are designed for fast and gentle cell separation with minimal labeling, enabling efficient processing of both labeled and unlabeled cells. Featuring a unique matrix of cell-friendly spheres, this advanced technology ensures precise and reliable results while preserving cell functionality. Used together, MACS MicroBeads and MACS Columns (fig. 2) deliver excellent yields and highly pure cells that are ready for immediate use in your experimental workflow.

Figure 2: The heart of MACS Technology centers around the MACS Column, featuring a matrix comprised of magnetic spheres.

When the MACS Column is placed in a magnetic field, for example a MACS Separator, an even magnetic force is amplified throughout the spheres. This gently and efficiently retains cells labeled with MACS MicroBeads.

Figure 3: MACS Column placed in a MidiMACS™ Separator.

LEARN MORE

Tailored formats for excellent results – find the optimal column for your cells at

▸ **miltenyibiotec.com/columns**

The spacious matrix inside MACS Columns, along with the strong magnetic field, allow unlabeled cells to flow through freely (fig. 4), remaining uncompressed and unharmed. Meanwhile, the labeled cells are gently cradled within the column (fig. 5). This minimizes stress on the cells and ensures efficient separation while preventing cell aggregation.

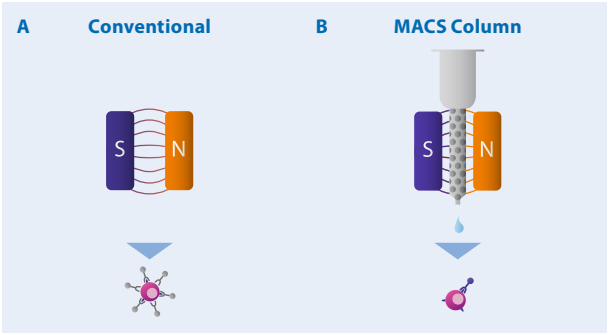


Figure 4: Without the use of a MACS Column, extensive labeling or large beads are needed for an adequate magnetic retention. Only when using MACS Columns, the amplification of the magnetic force ensures effective cell retention with minimal labeling.

MACS Columns enable gentle flow of cells. No pressure, sticking, or compression.

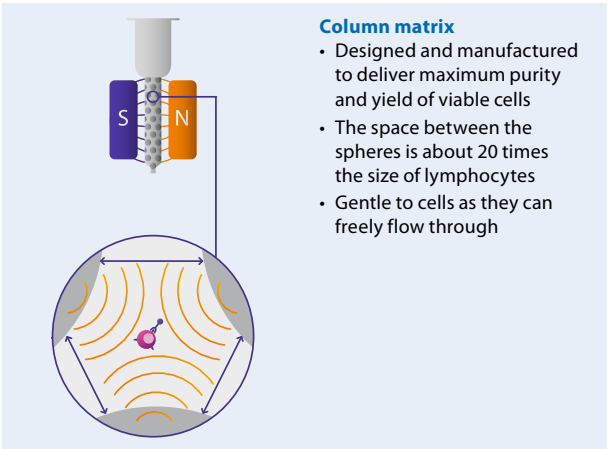
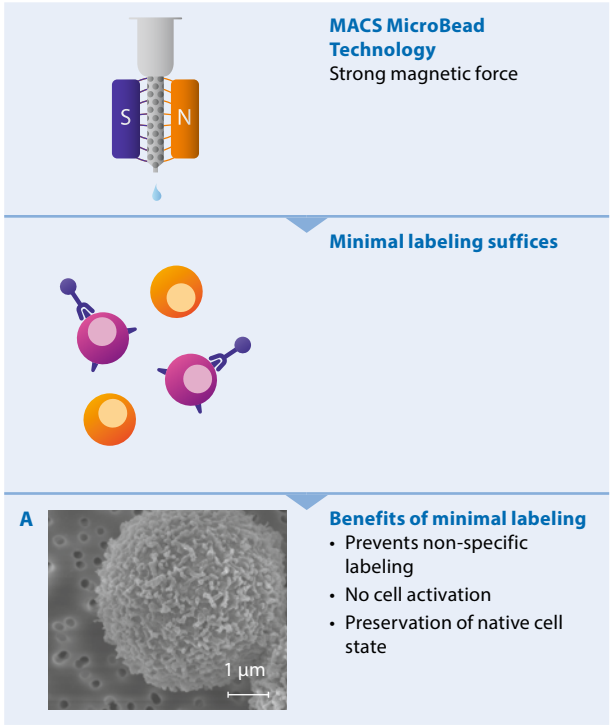


Figure 5: The MACS Column at a glance. Cells move freely between the spheres inside the column and are only retained by magnetic forces.

Select the best by combining MACS Columns and MACS MicroBeads

Advantage of column-based technology



Disadvantages of column-free technology

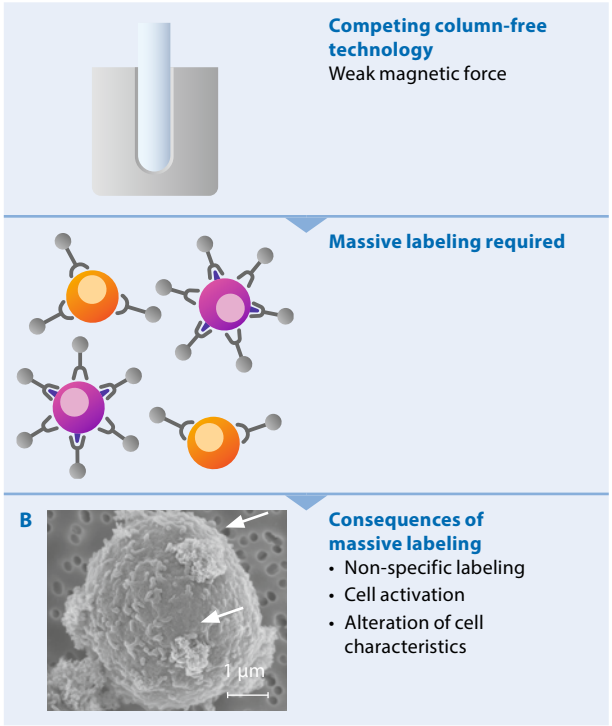


Figure 6: Human PBMCs were either labeled with MACS CD3 MicroBeads for the isolation of T cells with a MACS Column or with other nano-sized beads for column-free isolation of the same cell type. Scanning electron microscopy showed no visible labeling on the cell surface after isolation with MACS MicroBeads and MACS Columns (A), whereas excessive labeling became obvious (indicated by arrows) after isolation with column-free technology from another manufacturer (B).

YOUR BENEFITS

Why you are getting the best with MACS Technology:

- Effective separation for maximum purity and recovery
- Small bead size and minimal labeling means preserved cell functionality
- Cells are not stressed and retain viability
- Free epitopes, no bead aggregation, no epitope cross-linking for full downstream compatibility

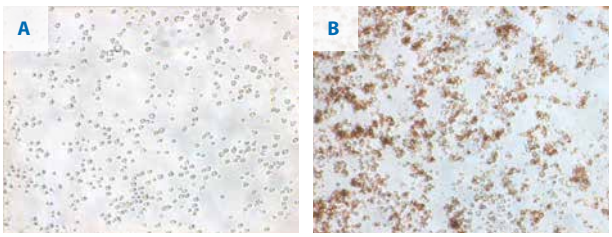


Figure 7: Light microscopic analysis of human PBMC cultures labeled with MACS CD3 MicroBeads or with nano-sized beads from another manufacturer. No bead accumulation in cell culture observed with MACS MicroBeads (A). Clearly visible bead aggregation (brown) with the other technology (B).

MACS MicroBead Kits

Straight forward positive selection of target cells based on specific markers

The magnetic spheres within MACS Columns transmit the magnetic field seamlessly from sphere to sphere when placed in a magnetic separator. This consistent and well-balanced magnetic field enables minimal cell labeling with small, nano-sized magnetic beads, which does not lead to cell activation (fig. 8).

- The generous space between the spheres, about 20 times the size of lymphocytes, enables gentle and smooth cell separation
- MicroBeads are non-toxic and biodegradable allowing compatibility with downstream applications
- Minimal labeling preserves free epitopes and cell functionality

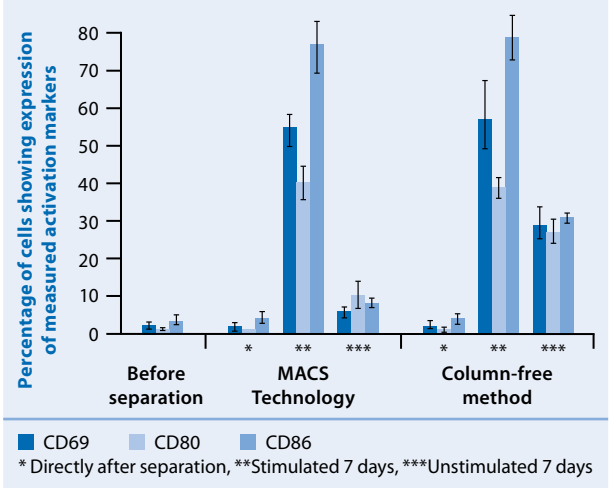


Figure 8: Human B cells were enriched using MACS CD19 MicroBeads or a column-free positive selection method from another manufacturer. Subsequently, cells were cultured for 7 days in the presence or absence of the B cell stimulation reagents CD40-Ligand/ Anti-His antibody and IL-4. Activation markers (CD69, CD80, and CD86) were measured by flow cytometry directly after cell isolation and after cultivation with and without stimulation. MACS MicroBeads did not alter the status of the target cells, whereas the column-free method led to the activation of B cells in the absence of stimulation reagents.

MACS Cell Isolation Kits

Depletion of non-target cells to obtain pure, truly untouched cells

MACS Isolation Kits are meticulously designed containing titrated antibodies and MACS MicroBeads for indirect magnetic labeling (fig. 9) and are the ideal option to avoid the binding of antibodies to your desired cells. The minimal labeling of undesired cells with MACS MicroBeads prevents non-specific labeling of desired cells, leaving them truly untouched (fig. 10). In contrast, column-free technologies rely on larger beads in substantial quantities to maintain labeled cells within a weaker magnetic field. These alternative methods often lead to complications such as aggregate formation, epitope blocking, and cross-linking.

- High purity and recovery rates
- Fully compatible with any downstream application
- Avoids non-specific labeling of target cells

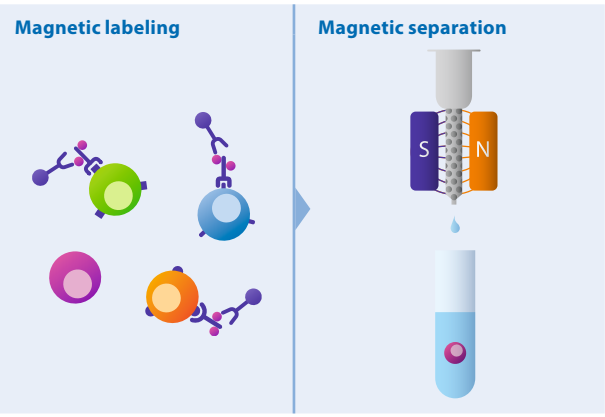


Figure 9: Non-target cells are magnetically labeled and depleted. During separation, the unlabeled target cell type is collected in the flow-through fraction. The labeled non-target cells are retained within the column.

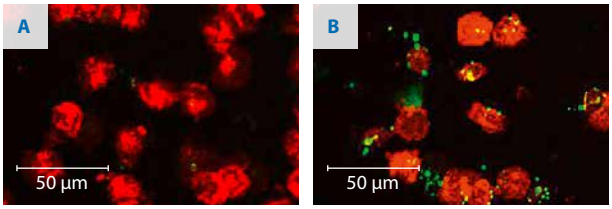


Figure 10: Monocyte depleted of unwanted cell using the MACS Monocyte Isolation Kit II, human (A), or a column-free kit from another manufacturer (B). Staining of monocytes (red) and nano-sized beads (green) shows non-specific labeling of target cells with column-free kits, while MACS Technology yielded untouched cells.

StraightFrom Technology

Cell isolation directly from blood products without density-gradient centrifugation

StraightFrom MicroBeads allow magnetic isolation of various leukocyte subsets from different starting materials by positive selection. With these kits, isolation of leukocyte subsets has never been easier or faster. Our StraightFrom blood product PBMC Isolation Kits are specifically designed for isolating highly pure PBMCs without granulocyte or erythrocyte contamination. In contrast to conventional methods, StraightFrom Technology does not require density-gradient centrifugation (fig. 11).

- Start directly with whole blood, buffy coat, Leukopak® and leukocyte reduction system chamber (LRSC)
- The isolated target cells are immediately ready for any downstream application
- Simple protocol with only a few handling steps

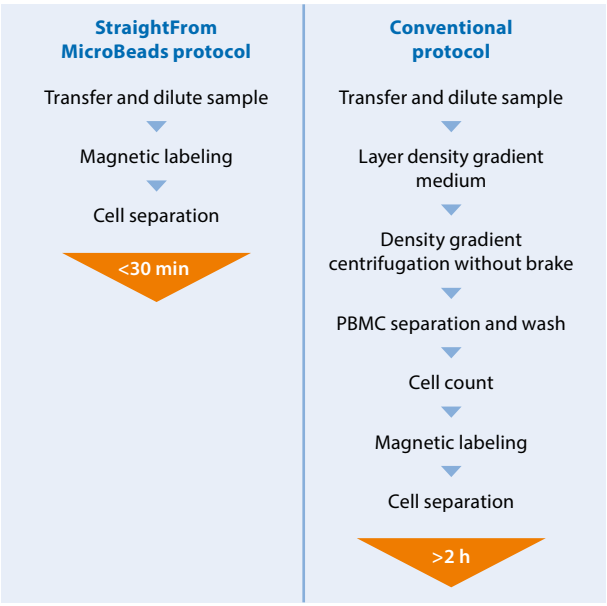


Figure 11: Comparison of the StraightFrom MicroBeads protocol with conventional protocols, demonstrating the simplicity and short hands-on time.

For isolation of different immune cells directly from mouse spleen tissue, our StraightFrom Spleen Kits are the ideal choice, suitable for both positive and negative isolation strategies.

MACSxpress Technology

High speed untouched target cell isolation from blood products

MACSxpress Technology enables the fastest large-scale isolation of untouched cells directly from whole blood – without the need for any centrifugation. Micro-sized MACSxpress Beads allow for minimal labeling to prevent non-specific labeling and activation of target cells. Non-target cells are removed by immunomagnetic depletion. Simultaneously, erythrocytes are sedimented to yield target cells of exceptional purity (fig. 12).

- Go from whole blood to pure cells within 20 minutes
- Obtain untouched target cells directly from whole blood
- No density gradient centrifugation, erythrocyte lysis, or cell counting required

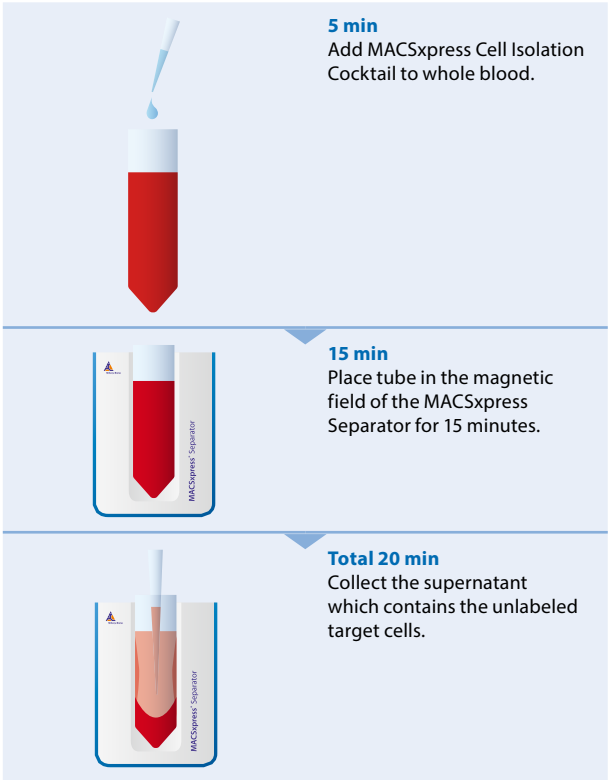


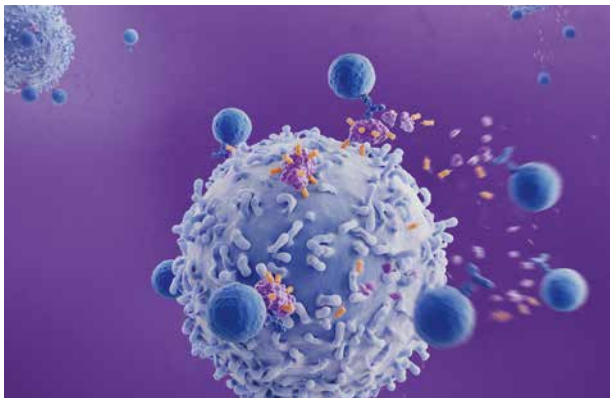
Figure 12: MACSxpress Technology allows the isolation of cells from whole blood within 20 minutes.

REAlease Technology

Get bead- and label-free cells

REAlease MicroBead Kits have been developed for positive selection of target cells from PBMCs. REAlease MicroBead Technology relies on recombinantly engineered antibody fragments instead of antibodies to label specific cell surface markers. The antibody fragments have a low affinity for cell surface epitopes. However, when the fragments are multimerized as a complex, they bind epitopes with high avidity and enable effective magnetic cell separation. REAlease Technology controls the multimer/monomer state of the fragments and thus triggers the release of monomerized antibody fragments from the cell surface after isolation. Ultimately, the isolated cells are free from antibody fragments and magnetic labels.

- Bead-free cells: suited for subsequent magnetic labeling
- Label-free cells: the epitope of a marker becomes completely available again
- Recombinantly produced: lot-to-lot consistency allows for reproducible results



LEARN MORE

Learn more about
REAlease MicroBead Technology at

▸ **miltenyibiotec.com/realease-microbeads**

UltraPure MicroBeads

Minimize debris for high-quality results

UltraPure MicroBeads have been particularly optimized for use with challenging samples. The unique formulation provides compelling benefits particularly when starting with materials that contain large amounts of cell debris or low numbers of target cells. UltraPure MicroBeads greatly improve recovery and purity of the sorted population by specifically enriching viable target cells (fig. 13).

- Optimized formulation to minimize debris
- High cell purity, even from challenging starting materials
- As easy to use as MACS MicroBeads

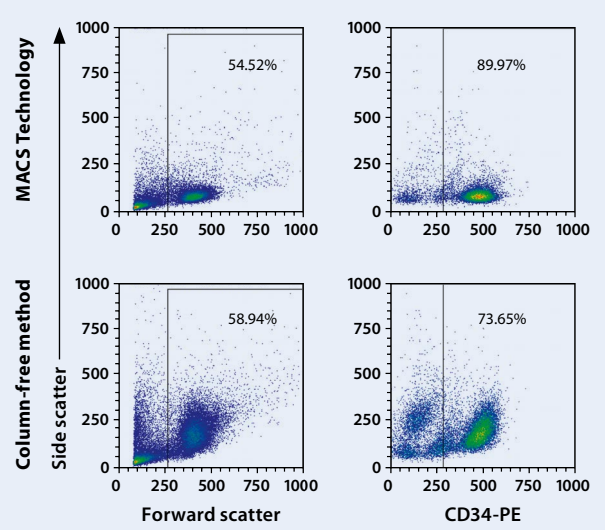


Figure 13: CD34⁺ cells were isolated with the column-based CD34 MicroBead Kit UltraPure (upper plots) or with a column-free positive selection method from another manufacturer (lower plots). The cell population purified with MACS MicroBeads UltraPure showed greatly reduced amounts of debris compared to the column-free method.

LEARN MORE

Find the separation strategy
that best fits your needs at

▸ **miltenyibiotec.com/separation-strategies**

Manual separation

Ease-of-use with manual MACS Separators for simple and straightforward setups in any lab.

- Perfect starting point into magnetic cell separation
- Proven technology in over 30,000 publications
- Perfectly tailored solutions for your experimental needs

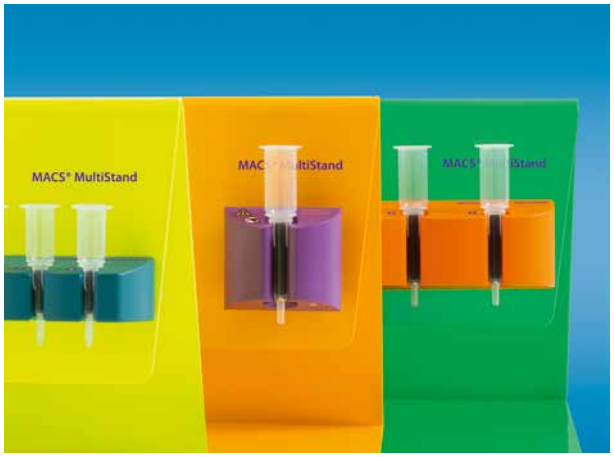


Figure 14: Manual MACS Separators equipped with MACS Columns.

LEARN MORE

First steps into MACS Technology – manual MACS Separators at a glance

▸ **miltenyibiotec.com/separators**

autoMACS® NEO Separator

Fully automated benchtop instrument for magnetic cell separation of multiple samples.

- Walk-away automation with cell labeling and isolation of up to six samples
- Standardized cell separation for reproducible, user-independent results
- Intuitive, easy-to-use software interface for a multi-user environment

Figure 15: Fully automated labeling and separation for the most convenient way to obtain pure cell populations with the autoMACS NEO Separator.

LEARN MORE

Explore the autoMACS NEO Separator features and watch the video at

▸ **miltenyibiotec.com/automacsneo**

SUPPORT

Miltenyi Biotec offers comprehensive technical support for both new and advanced users alike. Our experienced technical support teams have the knowledge and expertise to answer your questions.

You can reach us at your convenience by e-mail, phone, or online in our forums and Live Chat – find all the information at

▸ **miltenyibiotec.com/support**

No question is too big or small.

MultiMACS™ Cell24 Separator Plus

Efficient, semi-automatic cell isolation of large sample volumes or numbers.

- Convenient and easy handling of up to 24 samples in parallel or large sample volumes
- Compatible with any starting material and cell separation strategy
- Reliable, standardized process for reproducible results
- Can be integrated into liquid handlers for fully automated, customizable cell processing

Figure 16: Functional design for the isolation of large sample numbers or volumes with the semi-automated MultiMACS Cell24 Separator Plus.

LEARN MORE

Simultaneous multisample magnetic cell separation with the MultiMACS Cell24 Separator Plus

▸ **miltenyibiotec.com/multimacs**

MultiMACS X

Walk-away solution for high-throughput setups – the next level of automated cell separation.

- The benefits of the MultiMACS Cell24 Separator Plus integrated into a liquid handler for minimal hands-on time
- Tailored solutions for your specific application
- Sample tracking, run reports, and LIMS integration

Figure 17: Full automation, high-throughput processing, and sample tracking for true walk-away cell isolation with the MultiMACS X.

▶ miltenyibiotec.com/cellseparation

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