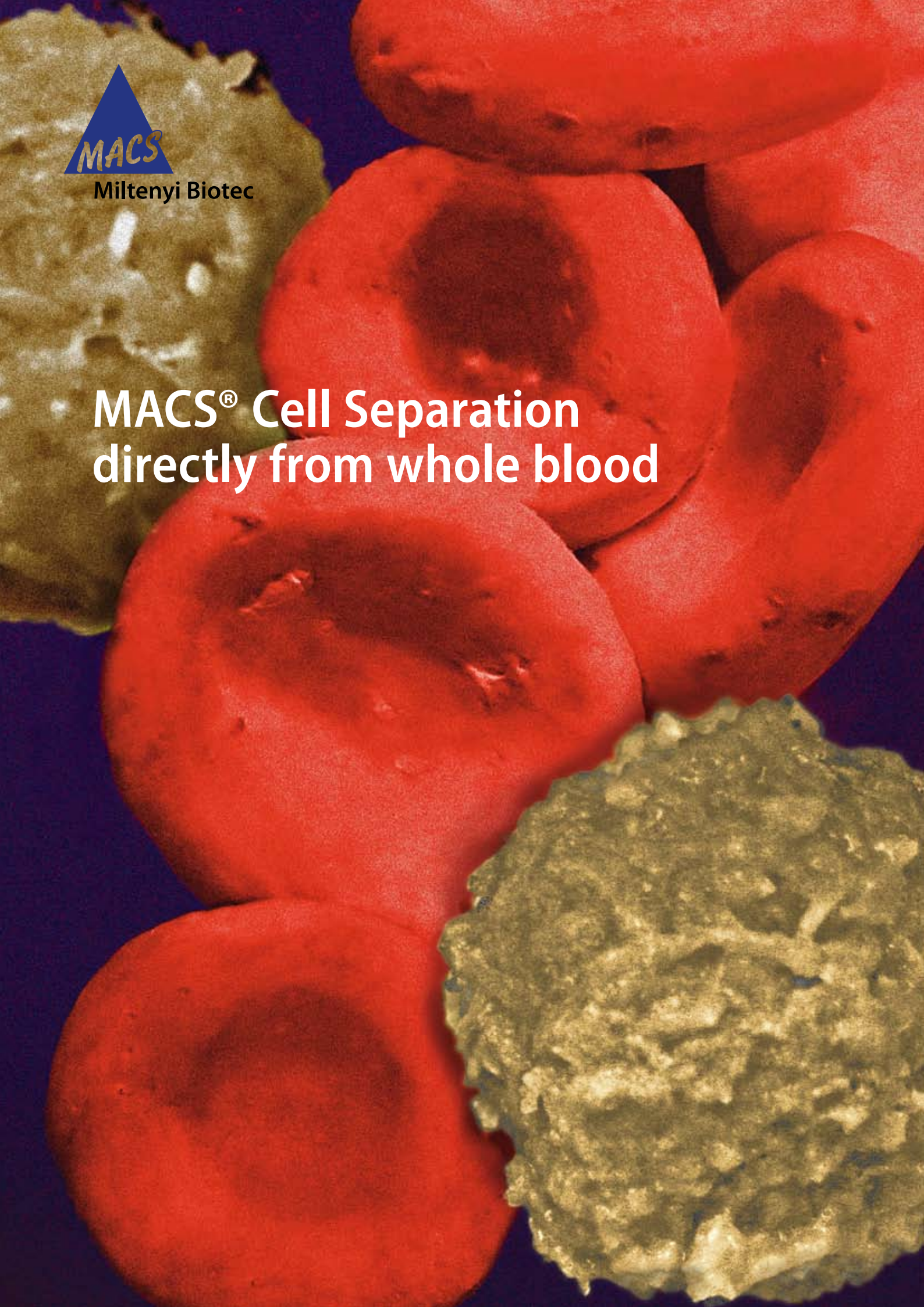




Miltenyi Biotec

**MACS® Cell Separation
directly from whole blood**





From whole blood straight to leukocyte subsets

MACS® Products for whole blood are just the right tools for quick and reliable cell separation

Miltenyi Biotec has developed numerous state-of-the-art tools for the immunomagnetic cell separation directly from whole blood or bone marrow.



The autoMACS™ Pro Separator allows fully automated magnetic cell separation

MACS® Whole Blood MicroBeads

MACS® Whole Blood MicroBeads are based on renowned MACS Technology allowing specific isolation of numerous leukocyte subsets. Anticoagulated blood samples are simply labeled with MicroBeads and sorted immediately. Thus, cell separation using Whole Blood MicroBeads can be easily standardized for highly reproducible results and also saves valuable time on the way to cell isolation. Cells can be separated by a straightforward manual procedure using the Whole Blood Column Kit or in an automated fashion with the autoMACS™ Pro Separator: Whole Blood MicroBeads are an attractive tool for occasional low-throughput tasks as well as for laboratories that routinely perform high numbers of cell separations.

- Gentle cell isolation by renowned MACS Technology
- Easy-to-standardize procedure, highly reproducible results
- Quick and specific cell isolation
- Manual or automated

CD15 MACSiBead™ Kit

If the enrichment of lymphocytes is sufficient and the isolation of a particular cell subset is not required for downstream experiments, the CD15 MACSiBead™ Kit represents a fast and easy alternative.



Short separation procedure—excellent results

No density gradient centrifugation or erythrocyte lysis required

Elimination of density gradient centrifugation from the cell separation procedure by using Whole Blood MicroBeads significantly reduces cell loss, resulting in high target cell recovery even from small sample volumes. No erythrocyte lysis is required, which minimizes stress to cells—a high viability rate of target cells is maintained.

Avoiding unnecessary steps during cell separation decreases the variability from sample to sample, operator to operator, and day to day, for high reproducibility. The reliable cell separation procedure can be easily standardized and automated.

Based on MACS Technology, cell separations with Whole Blood MicroBeads generally yield excellent purities of the target cells in a short time.

MACS® Whole Blood MicroBeads—facts and figures

- Flexible sample volumes: 0.25 mL–15 mL
- Excellent purity of target cell populations (90–95% on average)
- High yields also from material with low leukocyte counts or small sample volumes

Whole Blood MicroBeads are available for the isolation of numerous leukocyte subsets:

- CD3⁺, CD4⁺, or CD8⁺ T cells,
- CD14⁺ monocytes,
- CD15⁺ granulocytes,
- CD19⁺ B cells,
- CD45⁺ pan leukocytes,
- CD56⁺ NK cells,
- CD138⁺ plasma cells.

Fast enrichment of lymphocytes

For the quick enrichment of untouched lymphocytes from whole blood by elimination of granulocytes and erythrocytes, the CD15 MACSiBead™ Kit is the tool of choice. It is perfectly suited for applications that do not require the isolation of subsets, e.g., cell enumeration, ELISA, ELISpot analyses, and gene expression profiling. The CD15 MACSiBead Kit provides a fast cell separation procedure with minimal equipment requirements, namely the MACSiMAG™ Separator, e.g., for pharmacogenomics or toxicogenomics.

Fully automated cell sorting

The autoMACS™ Pro Separator allows separation of multiple whole blood samples in one go

The full potential of Whole Blood MicroBeads is revealed in combination with the autoMACS™ Pro Separator—a benchtop automated cell sorter for the processing of up to six samples, providing an outstanding solution for higher throughput. The instrument combines the high quality of immunomagnetic cell sorting by MACS® Technology with sensor-controlled sample processing, minimizing hands-on time for maximum efficiency and safety. Automated magnetic cell labeling takes autoMACS Pro Cell Separation to the next level. Using the specially developed MACS Cooling Tube Racks, the samples can be cooled for gentle sample handling.

MACS® Technology—features at a glance:

- Optimal recovery and excellent purity
- MACS MicroBeads are only 50 nm in size, gentle to cells, yielding viable and functionally active cells
- Easy separation of frequently occurring or rare cells
- Fast, straightforward, and reliable
- Cells can be immediately used for numerous downstream applications, e.g., flow cytometry, functional studies, molecular analysis.

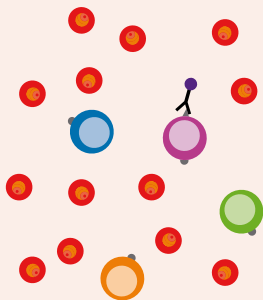


The autoMACS Pro Separator—a compact benchtop instrument

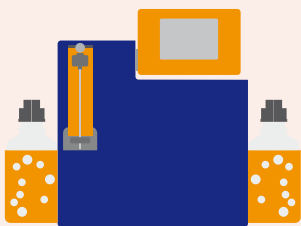
Automated and manual cell separation

Two options for maximum flexibility

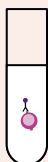
Automated processing for high sample numbers and standardization



Magnetic labeling can be performed automatically by the autoMACS™ Pro Separator.

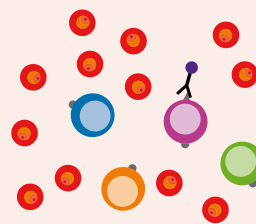


Automated cell separation
Labeled cells are positively selected with the autoMACS™ Pro Separator.

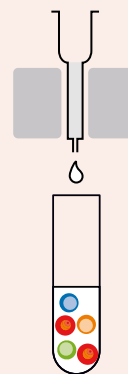


Highly pure cells are obtained automatically within 40 minutes in total.

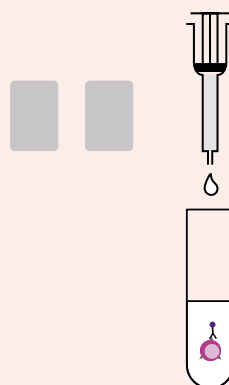
Manual processing for occasional cell separations



Magnetic labeling is performed for 15 minutes by directly adding Whole Blood MicroBeads to a volume of up to 15 mL of whole blood. Cells are washed in a 10-minute centrifugation step.



Manual cell separation
Cells are separated in a Whole Blood Column placed in a MACS Separator. Labeled cells are retained in the column, unlabeled cells flow through.



The column is removed from the separator. Cells are eluted as the highly pure, positively selected cell fraction.



Reliable results over and over again

More than 12,000 publications
based on MACS® Technology within 20 years

Since its introduction in 1989, MACS® Technology has become the gold standard in immunomagnetic cell separation, as substantiated by more than 12,000 publications. Accurate cell isolation techniques are required, e.g., for lineage-specific chimerism analysis to monitor donor leukocytes after allogeneic transplantation. A customer study based on MACS Whole Blood MicroBeads to purify leukocyte subsets for subsequent lineage-specific chimerism is presented here.

Customer report

Whole Blood MicroBeads for analysis of lineage-specific hematopoietic engraftment

Various patients received allogeneic hematopoietic stem cell transplantation (HSCT) for congenital

immunodeficiencies. The use of low-intensity conditioning with HSCT often results in mixed chimerism of donor and recipient cells. Whole Blood CD3, CD15, and CD19 MicroBeads were used to isolate T cells, neutrophils, and B cells, respectively, in an automated fashion. The engraftment status post-HSCT in these cell lineages was monitored by amplification of short tandem repeats using multiplex PCR. Lineage-specific chimerism analysis is shown in table 1. The analysis of donor chimerism levels in specific cell fractions can provide clinically relevant data, whereas monitoring chimerism in whole blood samples has limitations regarding clinical interpretation.

Patient	Disease	Type of HSCT	Whole blood	CD3 ⁺	CD15 ⁺	CD19 ⁺
P1	ADA-SCID	NC, MFD	38%	100%	0%	0%
P2	X-SCID	NC, Haplo	51%	100%	0%	2%
P3	Undefined SCID	C, MUD	16%	44%	17%	11%
P4	Undefined SCID	C, MUD	17%	77%	5%	0%
P5	WAS	C, MUD	30%	84%	4%	63%
P6	Neutrophil disorder	C, MUD	95%	22%	100%	63%

Table 1 Examples of cell lineage-specific chimerism analyses for congenital immunodeficiencies
NC = no conditioning, C = conditioning,
MFD = matched family donor, haplo = haplo-identical donor,
MUD = matched unrelated donor.

This customer report is an excerpt from: S. Adams, P. Veys, J. Hollifield, and B. Gaspar (2004) Cell lineage-specific chimerism in post-hematopoietic stem cell transplant patients. *MACS&more* 8-2: 16–17.



Well proven and versatile

MACS® Products for whole blood provide solutions for a multitude of research and routine applications

MACS® Whole Blood MicroBeads provide support for cutting-edge basic and clinical research. The options to standardize and automate the cell separation procedure make for an excellent tool for high-throughput laboratories.

MACS Whole Blood MicroBeads — applications

- Lineage-specific chimerism analysis after hematopoietic stem cell transplantation
- Cytogenetic analysis, e.g., of isolated plasma cells in multiple myeloma research
- Serological HLA typing and crossmatch analysis
- Clinical research, e.g., biomarker or risk factor discovery
- Functional studies, e.g., in drug discovery
- Automated cell sorting allows easy and safe handling of infectious material, e.g., in research on HIV or tuberculosis.
- Cell separation from small volumes, e.g., pediatric whole blood samples

Miltenyi Biotec stands for more than cell separation: The MACS® Research Product portfolio includes innovative instruments and reagents for sample preparation, cell separation, cell analysis, cell culture, and molecular biology.

MACS Products are perfect companions for experiments downstream of cell separation.

- The new MACSQuant™ Analyzer is a compact benchtop instrument for multiparametric flow cytometric analysis with fully automated sample handling.
- Numerous monoclonal antibodies for flow cytometry or fluorescence microscopy help identify a multitude of cell subsets.
- The portfolio also comprises a large variety of products and services for gene expression analysis. The fast and easy cell separation procedures with minimal impact on cellular function provided by MACS Technology are pivotal for highly reproducible and accurate gene expression profiling.

Miltenyi Biotec has a strong commitment to continual product development with regards to current and future basic and clinical research and is a long standing provider of instruments and reagents with clinical relevance.

Products for isolation of cell subsets	Order no.
Whole Blood CD3 MicroBeads, human	130-090-874
Whole Blood CD4 MicroBeads, human	130-090-877
Whole Blood CD8 MicroBeads, human	130-090-878
Whole Blood CD14 MicroBeads, human	130-090-879
Whole Blood CD15 MicroBeads, human	130-091-058
Whole Blood CD19 MicroBeads, human	130-090-880
Whole Blood CD45 MicroBeads, human	130-090-872
Whole Blood CD56 MicroBeads, human	130-090-875
Whole Blood CD138 MicroBeads, human	130-093-062
autoMACS™ Pro Starting Kit	130-092-545
Whole Blood Column Kit	130-093-545
MidiMACS™ Separation Unit	130-042-302
QuadroMACS™ Separation Unit	130-090-976

Products for enrichment of lymphocytes	Order no.
CD15 MACSiBead™ Kit, human	130-093-580
MACSiMAG™ Separator	130-092-168



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