Miltenyi Biotec

CD38 MicroBead Kit
human

Order no. 130-092-263

Contents

1. Description

Components	**2 mL CD38-Biotin, human:** Monoclonal CD38 antibodies conjugated to Biotin (isotype: mouse IgG2a). **2 mL Anti-Biotin MicroBeads:** MicroBeads conjugated to monoclonal anti-Biotin antibodies (isotype: mouse IgG1)
Size	For 10^9 total cells, up to 100 separations.
Product format	CD38-Biotin and Anti-Biotin MicroBeads are supplied in buffer containing stabilizer and 0.05% sodium azide.
Storage	Store protected from light at 2–8 °C. Do not freeze. The expiration date is indicated on the vial label.

1.1 Principle of the MACS® Separation

First, the $CD38^+$ cells are magnetically labeled with CD38-Biotin antibodies and Anti-Biotin MicroBeads. Then, the cell suspension is loaded onto a MACS® Column which is placed in the magnetic field of a MACS Separator. The magnetically labeled $CD38^+$ cells are retained within the column. The unlabeled cells run through; this cell fraction is depleted of $CD38^+$ cells. After removing the column from the magnetic field, the magnetically retained $CD38^+$ cells can be eluted as the positively selected cell fraction.

1.2 Background information

CD38 is a 45 kDa multilineage type II transmembrane glycoprotein. It is expressed at varying levels – depending on the developmental state and the activation status – on the majority of hematopoietic as well as on some nonhematopoietic cells. CD38 is absent on most primitive $CD34^+$ stem cells and upregulated on $CD34^+$ cells upon lymphocyte commitment.[1] CD38 is again absent on resting peripheral B and T cells, and upregulated during lymphocyte activation.[2]
Furthermore, the antigen is also found on NK cells, monocytes, dendritic cells, granulocytes, and in high levels on mature plasma cells.[3,4] Finally, CD38 shows a broad distribution in different tissues, such as pancreas, brain, muscle, and other organs.[5]
To date, CD38 was shown to have three main functions. First, it acts as bifunctional ectoenzyme catalyzing both the synthesis and hydrolysis of cyclic ADP-ribose, which itself participates in the regulation of cytoplasmic calcium levels.[6] Second, CD38 is known to be a cell membrane-bound receptor taking part in lymphocyte adhesion to endothelium via a CD38/CD31 interaction.[7] Furthermore, the CD38 receptor is involved in cell signaling processes that lead to the activation of T, B, and NK cells as well as monocytes.[8–10] Therefore, CD38 signaling requires a functional TCR/CD3 complex in T cells[11], a functional CD21/CD19 complex in B cells, and the presence of CD16 in NK cells.[2,8,9]

1.3 Applications

- Positive selection or depletion of hematopoietic cell subsets expressing human CD38 antigen, such as $CD38^+$ B, T, and NK cells from, for example, peripheral blood, bone marrow, or tissue.
- Positive selection or depletion of $CD38^+$ plasma cells from tissue such as bone marrow.
- Isolation of $CD34^+CD38^-$ stem cells from cord blood or bone marrow.

  To isolate distinct $CD38^+$ cell subsets, it is recommended to first isolate the cell type of interest with either a MACS MultiSort Kit (subsequent positive selections) or by depletion of non-target cells. For the latter approach, non-target cells are labeled with appropriate antibody cocktails and Anti-Ig or anti-fluorochrome MicroBeads. Magnetically labeled cells are subsequentely depleted in the magnetic field of a MACS Separator. In a second step, the $CD38^+$ subset can be positively selected with the CD38 MicroBead Kit.
  $CD38^-$ cell subsets, for example, $CD34^+CD38^-$ stem cells, must also be isolated in a two-step procedure. First, all $CD38^+$ cells are depleted with the CD38 MicroBead Kit. Then, the cell subset of interest can be enriched by positive selection using specific MACS MicroBeads, e.g., CD34 MicroBeads (# 130-046-701). Please refer to our website www.miltenyibiotec.com for more information on the various MACS Cell Separation Reagents that can be combined with the CD38 MicroBead Kit.

  ▲ **Note:** Sequential cell sorting with the $CD38^+$ MicroBead Kit and Anti-Biotin MicroBeads or Streptavidin MicroBeads is not recommended.

1.4 Reagent and instrument requirements

- Buffer: Prepare a solution containing phosphate-buffered saline (PBS), pH 7.2, 0.5% bovine serum albumin (BSA), and 2 mM EDTA by diluting MACS BSA Stock Solution (# 130-091-376) 1:20 with autoMACS® Rinsing Solution (# 130-091-222). Keep buffer cold (2–8 °C). Degas buffer before use, as air bubbles could block the column.

  ▲ **Note:** EDTA can be replaced by other supplements such as anticoagulant citrate dextrose formula-A (ACD-A) or citrate phosphate dextrose (CPD). BSA

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can be replaced by other proteins such as human serum albumin, human serum, or fetal bovine serum (FBS). Buffers or media containing Ca^{2+} or Mg^{2+} are not recommended for use.

- MACS Columns and MACS Separators: $CD38^+$ cells can be enriched by using MS, LS, or XS Columns or depleted with the use of LD, CS, or D Columns. Cells that strongly express the CD38 antigen can also be depleted using MS, LS, or XS Columns. Positive selection or depletion can also be performed by using the autoMACS Pro or the autoMACS Separator.

Column	Max. number of labeled cells	Max. number of total cells	Separator
Positive selection			
MS	10^7	2×10^8	MiniMACS, OctoMACS, VarioMACS, SuperMACS II
LS	10^8	2×10^9	MidiMACS, QuadroMACS, VarioMACS, SuperMACS II
XS	10^9	2×10^{10}	SuperMACS II
Depletion			
LD	10^8	5×10^8	MidiMACS, QuadroMACS, VarioMACS, SuperMACS II
CS	2×10^8		VarioMACS, SuperMACS II
D	10^9		SuperMACS II
Positive selection or depletion			
autoMACS	2×10^8	4×10^9	autoMACS Pro, autoMACS

▲ **Note:** Column adapters are required to insert certain columns into the VarioMACS™ or SuperMACS™ II Separators. For details refer to the respective MACS Separator data sheet.

- (Optional) Fluorochrome-conjugated antibodies for flow cytometric analysis, for example, Anti-Biotin-FITC (# 130-090-857), Anti-Biotin-PE (# 130-090-756), and Anti-Biotin-APC (# 130-090-856) or CD38-PE (# 130-092-260). $CD38^+$ B cells or plasma cell subsets can be identified by counterstaining with MACS CD19, CD20, or CD138 antibodies. For analysis of stem cells, counterstaining with MACS CD34, CD117, CD133, or CD271 antibodies is recommended. Finally, $CD38^+$ T cell subsets may be identified by using MACS CD3, CD4, or CD8 antibodies. For more information about antibodies refer to www.miltenyibiotec.com/antibodies.
- (Optional) Propidium Iodide Solution (# 130-093-233) or 7-AAD for flow cytometric exclusion of dead cells.
- (Optional) Dead Cell Removal Kit (# 130-090-101) for the depletion of dead cells.
- (Optional) Pre-Separation Filters, 30 µm (# 130-041-407) to remove cell clumps.

2. Protocol

2.1 Sample preparation

When working with anticoagulated peripheral blood or buffy coat, peripheral blood mononuclear cells (PBMCs) should be isolated by density gradient centrifugation, for example, using Ficoll-Paque™.

▲ **Note:** To remove platelets after density gradient separation, resuspend cell pellet in buffer and centrifuge at 200×g for 10–15 minutes at 20 °C. Carefully aspirate supernatant. Repeat washing step.

When working with tissues or lysed blood, prepare a single-cell suspension using standard methods.

For details refer to the protocols section at www.miltenyibiotec.com/protocols.

▲ Dead cells may bind non-specifically to MACS MicroBeads. To remove dead cells, we recommend using density gradient centrifugation or the Dead Cell Removal Kit (# 130-090-101).

2.2 Magnetic labeling

▲ Work fast, keep cells cold, and use pre-cooled solutions. This will prevent capping of antibodies on the cell surface and non-specific cell labeling.

▲ Volumes for magnetic labeling given below are for up to 10^7 total cells. When working with fewer than 10^7 cells, use the same volumes as indicated. When working with higher cell numbers, scale up all reagent volumes and total volumes accordingly (e.g. for 2×10^7 total cells, use twice the volume of all indicated reagent volumes and total volumes).

▲ For optimal performance it is important to obtain a single-cell suspension before magnetic labeling. Pass cells through 30 µm nylon mesh (Pre-Separation Filters, 30 µm # 130-041-407) to remove cell clumps which may clog the column. Moisten filter with buffer before use.

▲ The recommended incubation temperature is 2–8 °C. Higher temperatures and/or longer incubation times may lead to non-specific cell labeling. Working on ice may require increased incubation times.

1. Determine cell number.
2. Centrifuge cell suspension at 300×g for 10 minutes. Aspirate supernatant completely.
3. Resuspend cell pellet in 80 µL of buffer per 10^7 total cells.
4. Add 20 µL of CD38-Biotin per 10^7 total cells.
5. Mix well and incubate for 10 minutes in the refrigerator (2–8 °C).
6. Wash cells by adding 1–2 mL of buffer per 10^7 cells and centrifuge at 300×g for 10 minutes. Aspirate supernatant completely.
7. Resuspend cell pellet in 80 µL of buffer and add 20 µL of Anti-Biotin MicroBeads per 10^7 total cells.
8. Mix well and incubate for 15 minutes in the refrigerator (2–8 °C).
9. (Optional) Add staining antibodies, e.g., 10 µL of Anti-Biotin-FITC (# 130-090-857), and incubate for 5 minutes in the dark in the refrigerator (2–8 °C).
10. Wash cells by adding 1–2 mL of buffer per 10^7 cells and centrifuge at 300×g for 10 minutes. Aspirate supernatant completely.
11. Resuspend up to 10^8 cells in 500 µL of buffer.

    ▲ **Note:** For higher cell numbers, scale up buffer volume accordingly.

    ▲ **Note:** For depletion with LD Columns, resuspend up to 1.25×10^8 cells in 500 µL of buffer.
12. Proceed to magnetic separation (2.3).

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2.3 Magnetic separation

▲ Choose an appropriate MACS Column and MACS Separator according to the number of total cells and the number of CDxx$^+$ cells. For details refer to the table in section 1.4.

▲ Always wait until the column reservoir is empty before proceeding to the next step.

Magnetic separation with MS or LS Columns

1. Place column in the magnetic field of a suitable MACS Separator. For details refer to the respective MACS Column data sheet.
2. Prepare column by rinsing with the appropriate amount of buffer:

   MS: 500 µL LS: 3 mL
3. Apply cell suspension onto the column. Collect flow-through containing unlabeled cells.
4. Wash column with the appropriate amount of buffer. Collect unlabeled cells that pass through and combine with the flow-through from step 3.

   MS: 3×500 µL LS: 3×3 mL

   ▲ **Note:** Perform washing steps by adding buffer aliquots only when the column reservoir is empty.
5. Remove column from the separator and place it on a suitable collection tube.
6. Pipette the appropriate amount of buffer onto the column. Immediately flush out the magnetically labeled cells by firmly pushing the plunger into the column.

   MS: 1 mL LS: 5 mL
7. (Optional) To increase the purity of CD38$^+$ cells, the eluted fraction can be enriched over a second MS or LS Column. Repeat the magnetic separation procedure as described in steps 1 to 6 by using a new column.

Magnetic separation with XS Columns

For instructions on the column assembly and the separation refer to the XS Column data sheet.

Depletion with LD Columns

1. Place LD Column in the magnetic field of a suitable MACS Separator. For details refer to the LD Column data sheet.
2. Prepare column by rinsing with 2 mL of buffer.
3. Apply cell suspension onto the column.
4. Collect unlabeled cells that pass through and wash column with 2×1 mL of buffer. Collect total flow-through; this is the unlabeled cell fraction. Perform washing steps by adding buffer two times. Only add new buffer when the column reservoir is empty.

Depletion with CS Columns

1. Assemble CS Column and place it in the magnetic field of a suitable MACS Separator. For details refer to the CS Column data sheet.
2. Prepare column by filling and rinsing with 60 mL of buffer. Attach a 22G flow resistor to the 3-way stopcock of the assembled column. For details refer to the CS Column data sheet.
3. Apply cell suspension onto the column.
4. Collect unlabeled cells that pass through and wash column with 30 mL buffer from the top. Collect total flow-through; this is the unlabeled cell fraction.

Depletion with D Columns

For instructions on column assembly and separation refer to the D Column data sheet.

Magnetic separation with the autoMACS® Pro Separator or the autoMACS® Separator

▲ Refer to the respective user manual for instructions on how to use the autoMACS® Pro Separator or the autoMACS Separator.

▲ Buffers used for operating the autoMACS Pro Separator or the autoMACS Separator should have a temperature of ≥10 °C.

▲ Program choice depends on the isolation strategy, the strength of magnetic labeling, and the frequency of magnetically labeled cells. For details refer to the section describing the cell separation programs in the respective user manual.

Magnetic separation with the autoMACS® Pro Separator

1. Prepare and prime the instrument.
2. Apply tube containing the sample and provide tubes for collecting the labeled and unlabeled cell fractions. Place sample tube in row A of the tube rack and the fraction collection tubes in rows B and C.
3. For a standard separation choose one of the following programs:

   Positive selection: Possel
   Collect positive fraction in row C of the tube rack.

   Depletion: Depletes
   Collect negative fraction in row B of the tube rack.

Magnetic separation with the autoMACS® Separator

1. Prepare and prime the instrument.
2. Apply tube containing the sample and provide tubes for collecting the labeled and unlabeled cell fractions. Place sample tube at the uptake port and the fraction collection tubes at port neg1 and port pos1.
3. For a standard separation choose one of the following programs:

   Positive selection: Possel
   Collect positive fraction from outlet port pos1.

   Depletion: Depletes
   Collect negative fraction from outlet port neg1.

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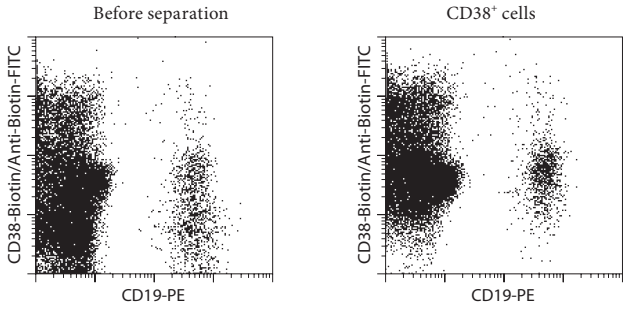
3. Example of a separation using the CD38 MicroBead Kit

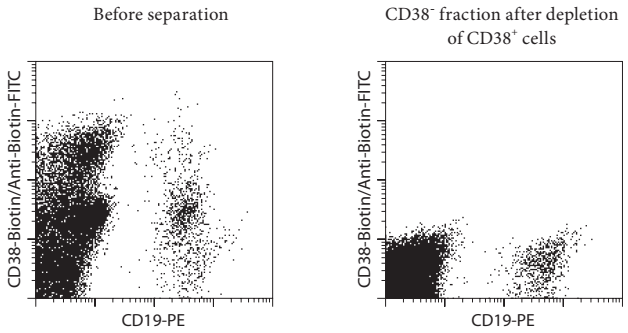
Positive selection

Positive selection of CD38$^+$ cells from PBMCs using the CD38 MicroBead Kit, an MS Column, and a MiniMACS™ Separator. CD38$^+$ cells labeled with the CD38 MicroBead Kit are fluorescently stained with Anti-Biotin-FITC (# 130-090-857) and CD19-PE (# 130-091-247). Cell debris and dead cells were excluded from the analysis based on scatter signals and PI fluorescence.



Depletion

Depletion of CD38$^+$ cells from PBMCs using the CD38 MicroBead Kit, an LD Column, and a MidiMACS™ Separator. Cell fractions are fluorescently stained with Anti-Biotin-FITC (# 130-090-857) and CD19-PE (# 130-091-247) to detect cells labeled with the CD38 MicroBead Kit. Cell debris and dead cells were excluded from the analysis based on scatter signals and PI fluorescence.



4. References

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Refer to **www.miltenyibiotec.com** for all data sheets and protocols. Miltenyi Biotec provides technical support worldwide. Visit www.miltenyibiotec.com/local to find your nearest Miltenyi Biotec contact.

Warnings

Reagents contain sodium azide. Under acidic conditions sodium azide yields hydrazoic acid, which is extremely toxic. Azide compounds should be diluted with running water before discarding. These precautions are recommended to avoid deposits in plumbing where explosive conditions may develop.

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