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### 1. Description

<b>Components</b>	2 mL CD11c MicroBeads, mouse: MicroBeads conjugated to monoclonal anti-mouse CD11c antibodies (isotype: hamster IgG).
<b>Capacity</b>	For $2 \times 10^9$ total cells.
<b>Product format</b>	CD11c MicroBeads are supplied in buffer containing stabilizer and 0.05% sodium azide.
<b>Storage</b>	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 CD11c<sup>+</sup> cells are magnetically labeled with CD11c 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 CD11c<sup>+</sup> cells are retained within the column. The unlabeled cells run through; this cell fraction is thus depleted of CD11c<sup>+</sup> cells. After removing the column from the magnetic field, the magnetically retained CD11c<sup>+</sup> cells can be eluted as the positively selected cell fraction. To increase the purity, the positively selected cell fraction containing the CD11c<sup>+</sup> cells is separated over a second column.

#### 1.2 Background information

CD11c MicroBeads were developed for the isolation of mouse dendritic cells (DCs) from single-cell suspensions of lymphoid and non-lymphoid tissues. Unlike in humans, CD11c is expressed in mice on all defined DC subsets. With CD11c MicroBeads, complicated procedures for the isolation of DCs are replaced by a fast and simple positive selection strategy.

### 1.3 Applications

- Isolation of DCs for analysis of their phenotypical and functional properties or studies on T cell activation, polarization and tolerance induction in different experimental mouse models.
- Isolation of highly pure DCs from spleen and lymph nodes<sup>1</sup>, Peyer's patches<sup>2</sup>, colonic lamina propria<sup>3</sup>, bone marrow<sup>4</sup>, epidermis<sup>5</sup>, lung<sup>6</sup>, liver<sup>7</sup>, or brain<sup>8</sup>.

### 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 can be replaced by other proteins such as mouse serum albumin, mouse serum, or fetal bovine serum (FBS). Buffers or media containing Ca<sup>2+</sup> or Mg<sup>2+</sup> are not recommended for use.
- **MACS Columns and MACS Separators:** CD11c<sup>+</sup> cells can be enriched by using MS, LS, or XS Columns or depleted with the use of LD, CS, or D Columns. Cells which strongly express the CD11c 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
<b>Positive selection</b>			
MS	10 <sup>7</sup>	2×10 <sup>8</sup>	MiniMACS, OctoMACS, VarioMACS, SuperMACS
LS	10 <sup>8</sup>	2×10 <sup>9</sup>	MidiMACS, QuadroMACS, VarioMACS, SuperMACS
XS	10 <sup>9</sup>	2×10 <sup>10</sup>	SuperMACS
<b>Depletion</b>			
LD	10 <sup>8</sup>	5×10 <sup>8</sup>	MidiMACS, QuadroMACS, VarioMACS, SuperMACS
CS	2×10 <sup>8</sup>		VarioMACS, SuperMACS
D	10 <sup>9</sup>		SuperMACS
<b>Positive selection or depletion</b>			
autoMACS	2×10 <sup>8</sup>	4×10 <sup>9</sup>	autoMACS Pro, autoMACS

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

- **Collagenase D:** 2 mg/mL (Collagenase D >0.15 U/mg, e.g., from Roche Diagnostics, Germany) in 10 mM Hepes-NaOH pH 7.4, 150 mM NaCl, 5 mM KCl, 1 mM MgCl<sub>2</sub>, 1.8 mM CaCl<sub>2</sub>.

- (Optional) Fluorochrome-conjugated CD11c antibodies for flow cytometric analysis, e.g., CD11c-FITC, mouse (# 130-091-842), CD11c-PE, mouse (# 130-091-830), or CD11c-APC, mouse (# 130-091-844). For more information about fluorochrome-conjugated antibodies see [www.miltenyibiotec.com](http://www.miltenyibiotec.com).
  - (Optional) FcR Blocking Reagent, mouse (# 130-092-575) to avoid Fc receptor-mediated antibody labeling.
  - (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 (# 130-041-407) to remove cell clumps.
4. Add 100  $\mu\text{L}$  of CD11c MicroBeads per  $10^8$  total cells.
  5. Mix well and incubate for 15 minutes in the refrigerator (2–8 °C).
  6. Wash cells by adding 1–2 mL of buffer per  $10^7$  cells and centrifuge at  $200\times g$  for 10 minutes. Aspirate supernatant completely.
  7. Resuspend up to  $10^8$  cells in 500  $\mu\text{L}$  of buffer.
    - ▲ **Note:** For higher cell numbers, scale up buffer volume accordingly.
    - ▲ **Note:** For depletion with LD Columns, resuspend up to  $1.25\times 10^8$  cells in 500  $\mu\text{L}$  of buffer.
  8. Proceed to magnetic separation (2.3).

## 2. Protocol

### 2.1 Sample preparation

For highest recovery and purity of CD11c<sup>+</sup> DCs from mouse spleen, single-cell suspensions have to be prepared by enzymatic disaggregation with Collagenase D. Protocols which rely only on mechanical disruption are not recommended.

For preparing a single-cell suspension please refer to our gentleMACS™ Protocol “Preparation of single-cell suspensions from mouse spleen with Collagenase D treatment”.

For details see the protocols section at [www.miltenyibiotec.com/protocols](http://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  $10^8$  total cells. When working with fewer than  $10^8$  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  $2\times 10^8$  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  $\mu\text{m}$  nylon mesh (Pre-Separation Filters, # 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. Working on ice may require increased incubation times. Higher temperatures and/or longer incubation times may lead to non-specific cell labeling.

1. Determine cell number.
2. Centrifuge cell suspension at  $200\times g$  for 10 minutes. Aspirate supernatant completely.
3. Resuspend cell pellet in 400  $\mu\text{L}$  of buffer per  $10^8$  total cells.

▲ **Note:** To obtain high purities of DCs ( $\geq 90\%$ ), Fc receptor-mediated magnetic labeling should be blocked by adding FcR Blocking Reagent (CD16/32 antibody) or mouse immunoglobulin (1 mg per 500  $\mu\text{L}$  labeling volume) to the cell suspension before adding CD11c MicroBeads.



### 2.3 Magnetic separation

▲ Choose an appropriate MACS Column and MACS Separator according to the number of total cells and the number of CD11c<sup>+</sup> cells. For details see 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 see the respective MACS Column data sheet.

2. Prepare column by rinsing with the appropriate amount of buffer:

MS: 500  $\mu\text{L}$       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 effluent from step 3.

MS:  $3\times 500 \mu\text{L}$       LS:  $3\times 3 \text{ mL}$

▲ **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. To increase the purity of CD11c<sup>+</sup> 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 see 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 effluent; 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 see 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 see 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 effluent; 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  $\geq 10$  °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

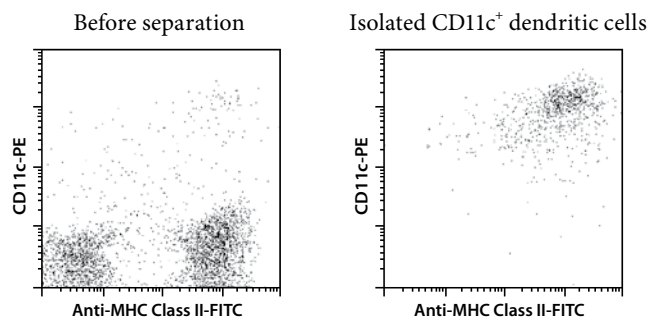
1. Prepare and prime the instrument.
2. Apply tube containing the sample and provide tubes for collecting the labeled and unlabeled cell fractions. Place sample tube in row A of the tube rack and the fraction collection tubes in rows B and C.
3. For a standard separation choose one of the following programs:  
Positive selection: "Posseld"  
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 pos2.
3. For a standard separation choose one of the following programs:  
Positive selection: "Posseld"  
Collect positive fraction from outlet port pos2.  
  
Depletion: "Depletes"  
Collect negative fraction from outlet port neg1.

### 3. Example of a separation using the CD11c MicroBeads

CD11c<sup>+</sup> DCs were isolated from mouse spleen cell suspension using CD11c MicroBeads, a MiniMACS™ Separator, and two MS Columns. The cells are fluorescently stained with CD11c-PE (# 130-091-830) and Anti-MHC Class II-FITC (# 130-081-601). Cell debris and dead cells were excluded from the analysis based on scatter signals and propidium iodide fluorescence.



### 4. References

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All protocols and data sheets are available at [www.miltenyibiotec.com](http://www.miltenyibiotec.com).

**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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