

DATA EXAMPLES

Differentiation of CD14⁺ monocytes into M2 macrophages is confirmed by CD marker staining (CD14⁺ CD80⁻ CD163⁺ CD206⁺) and secretion of IL-12 and IL-10 (IL-10^{high} IL-12^{low}).

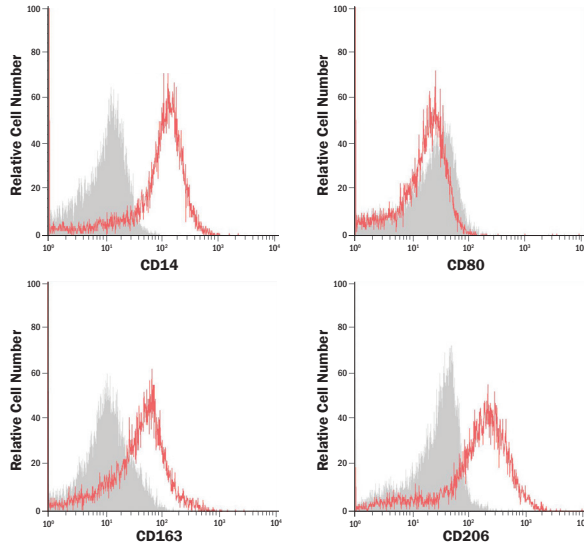


Figure 1: Phenotypic Analysis of human M2 Macrophages. Flow cytometry data show cell surface marker expression of human peripheral blood CD14⁺ monocytes following differentiation using reagents included in the Human M2 Macrophage Differentiation Kit. On day 6 of the differentiation, cells were harvested and stained with antibodies for CD14, CD80, CD163, and CD206 (open histograms). Cell staining was gated using isotype control antibodies (filled histograms). M2 macrophages display a CD14⁺ CD80⁻ CD163⁺ CD206⁺ phenotype. All R&D Systems antibodies and corresponding catalog numbers used in this figure are shown in the table below.

SUGGESTED REAGENTS FOR FLOW CYTOMETRY

CATALOG #	DESCRIPTION
FAB3832F	Human CD14 Fluorescein-conjugated Antibody (Clone 134620), Mouse Ig _{G1}
IC002F	Mouse Ig _{G1} Fluorescein Isotype Control (Clone 11711), Mouse Ig _{G1}
FAB140P	Human B7-1/CD80 PE-conjugated Antibody (Clone 37711), Mouse Ig _{G1}
IC002P	Mouse Ig _{G1} PE-conjugated Isotype Control (Clone 11711), Mouse Ig _{G1}
FAB1607C	Human CD163 PerCP-conjugated Antibody (Clone 215927), Mouse Ig _{G1}
IC002C	Mouse Ig _{G1} PerCP Isotype Control (Clone 11711), Mouse Ig _{G1}
FAB25342A	Human MMR/CD206 APC-conjugated Antibody (Clone 685641), Mouse Ig _{G2a}
IC003A	Mouse Ig _{G2a} APC-conjugated Isotype Control (Clone 20102), Mouse Ig _{G2a}

DATA EXAMPLES CONTINUED

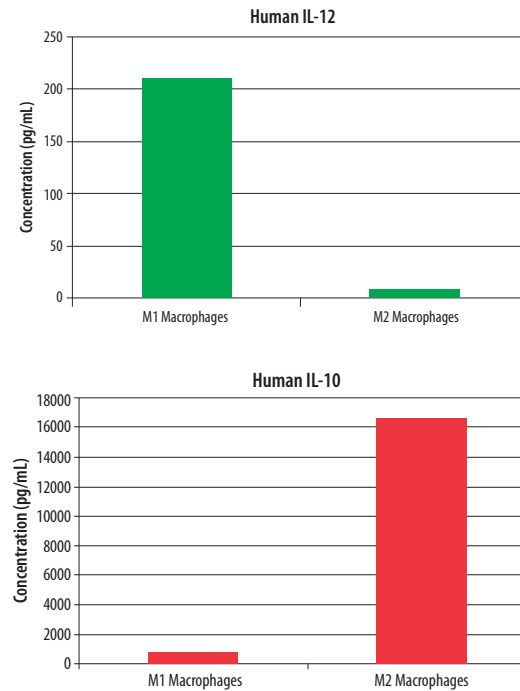


Figure 2: Differentiated Human M2 Macrophages Secrete IL-10. Human peripheral blood CD14⁺ monocytes were differentiated for 6 days under M1 or M2 macrophage polarization conditions using reagents included in the CellXVivo™ Human M2 Differentiation Kit or the CellXVivo™ M1 Macrophage Differentiation (R&D Systems, Catalog # CDK012). On day 6, M2 and M1 macrophages were stimulated with 1 µg/mL LPS for 24 hours. Cell culture supernatant was collected and cytokine secretion was determined using the Human IL-12 p70 Quantikine® HS ELISA Kit and the Human IL-10 Quantikine® ELISA Kit. All relevant R&D Systems Quantikine® ELISA kits and corresponding catalog numbers are listed below.

SUGGESTED REAGENTS FOR ELISA

CATALOG #	DESCRIPTION
HS120	Human IL-12 p70 Quantikine® HS ELISA Kit
D1000B	Human IL-10 Quantikine® ELISA Kit

CellXVivo™

Human M2 Macrophage Differentiation Kit

Catalog Number: CDK013

BACKGROUND

Macrophages derived from circulating inflammatory or resident monocytes are recruited to areas of tissue inflammation in response to injury or pathogenic insult. Monocyte-derived macrophages also replenish apoptotic resident macrophages to maintain tissue homeostasis (1). Macrophages can be classified into two major subtypes: type 1 or classically activated macrophages (M1) and type 2 or alternatively activated macrophages (M2) (2). *In vitro*, monocytes can be differentiated into M1 and M2 macrophages using GM-CSF or M-CSF, respectively. Each subtype can be characterized by their expression of a distinct set of cell-surface proteins and pro- or anti-inflammatory cytokines (3). M1 macrophages produce pro-inflammatory cytokines that combat pathogenic infection and reduce the infectivity of microbes. Prolonged or excessive activation of M1 macrophages can result in secondary damage to host tissue. M2 macrophages produce growth factors and anti-inflammatory cytokines to suppress the host immune response, promote wound healing and tissue remodeling, and improve metabolic and endocrine signaling within tissues (4, 5). The Human M2 Macrophage Differentiation Kit contains optimized components to differentiate human CD14⁺ monocytes into CD14⁺CD80⁻CD163⁺CD206⁺ M2 macrophages. When activated using Lipopolysaccharide (LPS), these M2 macrophages have high expression of IL-10 and low IL-12 expression.

This package insert must be read in its entirety before using this product. For research use only. Not for use in diagnostic procedures.

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MATERIALS PROVIDED & STORAGE CONDITIONS

Store the unopened kit at $\leq -20\text{ }^{\circ}\text{C}$ in a manual defrost freezer. Do not use past kit expiration date.

COMPONENTS	PART #	# VIALS	STORAGE OF OPENED/ RECONSTITUTED MATERIAL
Serum-Free Base Media	390536	1 vial	May be stored at 2-8 °C under sterile conditions for up to 30 days or at -20 °C to -70 °C in a manual defrost freezer for up to 3 months.*
Recombinant Human M-CSF	967991	1 vial	
Reconstitution Buffer 2	967553	1 vial	May be stored under sterile conditions for up to 3 months at 2-8 °C.*

* Provided this is within the expiration date of the kit.

OTHER MATERIALS & SUPPLIES REQUIRED

- MagCollect™ Human CD14⁺ Cell Isolation Kit (R&D Systems®, Catalog # MAGH105, or equivalent).
- Ficoll-Hypaque™
- Tissue culture plates and/or flasks
- Penicillin (optional)
- Streptomycin (optional)
- Cell Dissociation Solution Non-enzymatic 1x (Sigma)
- Lipopolysaccharide (LPS) (Sigma, Catalog # L3024)
- Inverted microscope
- Hemocytometer
- 37 °C, 5% CO₂ incubator
- Centrifuge
- Pipettes and pipette tips

REFERENCES

1. Chávez-Galán, L. *et al.* (2015) *Front. Immunol.* **6**:263.
2. Mills, C.D. (2015) *Front. Immunol.* **6**:212.
3. Rey-Giraud, F. *et al.* (2012) *PLoS One.* **7**:e42656.
4. Wang, N. *et al.* (2014) *Front. Immunol.* **5**:614.
5. Rószler, T (2015) *Mediators Inflamm.* **2015**:816460.

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REAGENT PREPARATION

Serum-Free Base Media - Thaw at 2-8 °C or at room temperature.

Recombinant Human M-CSF (500X) - Add 200 μL of Reconstitution Buffer 2 to the vial of Recombinant Human M-CSF to produce Recombinant Human M-CSF (500X).

Human M2 Macrophage Differentiation Media - Add 20 μL Recombinant Human M-CSF (500X) to 10 mL of Serum-Free Base Media (**optional**: add Penicillin at 100 units/mL and Streptomycin at 100 $\mu\text{g}/\text{mL}$).

PROTOCOL FOR M2 MACROPHAGE DIFFERENTIATION

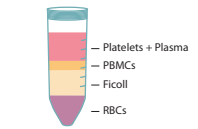
1. Isolate human peripheral blood mononuclear cells (PBMCs) from human blood using Ficoll-Hypaque density gradient centrifugation.
2. Enrich human CD14⁺ monocytes from human PBMC using the MagCollect™ Human CD14⁺ Cell Isolation Kit.
3. Suspend human CD14⁺ monocytes at 2×10^6 cells/mL in Human M2 Macrophage Differentiation Media.
4. Add cells to plate.

SIZE	SUGGESTED CULTURE VOLUME
6-well plate	4 mL/well
24-well plate	1 mL/well
96-well plate	200 μL /well

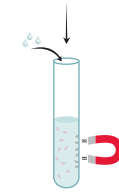
5. Incubate cells in a 37 °C, 5% CO₂ humidified incubator for 3 days.
6. On day 3, refresh the Human M2 Macrophage Differentiation Media. For each well of a 96-well plate, remove 100 μL of the media, for each well of a 24-well plate remove 500 μL of media, for each well of a 6-well plate remove 2 mL of media. For each plate size, replenish removed media with an equal volume of fresh Human M2 Macrophage Differentiation Media.
7. Incubate the cells as in step 5 for an additional 3 days.
8. On day 6 of differentiation, the differentiated M2 macrophages are ready for downstream applications.
9. Activation (**optional**): Harvest cells using an enzyme free cell dissociation solution. Resuspend cells in Serum-Free Base Media and stimulate cells with 1 $\mu\text{g}/\text{mL}$ LPS for 24 hours.
10. **Optional**: To verify M2 macrophage differentiation via flow cytometry, collect the cells using enzyme free cell dissociation solution. Process, stain, and analyze M2 macrophage marker expressions via flow cytometry, as shown in the Data Examples.
11. **Optional**: To verify M2 macrophage differentiation via ELISA, harvest cells using enzyme free cell dissociation solution. Resuspend cells in Serum-Free Base Media and stimulate cells with 1 $\mu\text{g}/\text{mL}$ LPS for 24 hours. Analyze IL-12 and IL-10 in cell culture supernatant using the Human IL-12 p70 Quantikine® HS ELISA Kit (R&D Systems®, Catalog # HS120) or the Human IL-10 Quantikine® ELISA Kit (R&D Systems®, Catalog # D1000B), respectively.

PROTOCOL OUTLINE

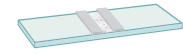
Isolate PBMCs from human blood.



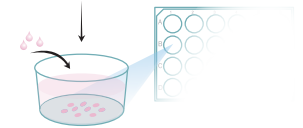
Enrich human CD14⁺ monocytes from PBMCs (e.g., using magnetic cell selection).



Perform a cell count.



Suspend 2×10^6 cells/mL in Human M2 Macrophage Differentiation Media. **Culture** the cells on plates for 6 days. **Add** fresh Human M2 Macrophage Differentiation Media on day 3.



Verify M2 macrophage differentiation on day 6 by analyzing cell surface marker expression via flow cytometry. **M2 macrophages** are ready for downstream application.

