Primary blood and immune cells for research
Agenda

- Introduction and hematopoiesis
- Tissue sources - overview
- Donor variety
- Products by tissue type
- Applications
- Support and resources
Not every cell will work in your assay…
Discover our expanded portfolio of blood and immune cells

01. Highest quality blood tissue and cells

02. Unmatched donor and cell variety

03. X-VIVO™ Serum-free Hematopoietic Cell Culture Media – with cell guarantee*

04. World-class scientific support team

05. More than cells – support for wide ranging workflows including transfection using Lonza’s Nucleofector™ Technology

06. Global supply reach

07. Full donor consent and IRB-approved collection facilities

08. Certificate of Analysis, SDS in multiple languages

* Lonza guarantees the performance of Clonetics™/Poietics™ Cells only if appropriate Clonetics™/Poietics™ Media and Reagents are used exclusively and the recommended storage and use protocols are followed. Any modifications made to the recommended cell systems including the use of alternative media, reagents or protocols, will void cell and media performance guarantees. If you need assistance in selecting the appropriate media, reagents, or protocol, please contact Lonza Scientific Support.
The hematopoietic system
From stem cells to T cells

Stem Cell

Lymphoid Progenitor

Myeloid Progenitor

B cell

T cell

Natural Killer

Monocyte

Basophil

Eosinophil

Neutrophil

Dendritic Cell

Macrophage
## Blood sources

<table>
<thead>
<tr>
<th>Blood Source</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
| Bone Marrow  | - The source of hematopoiesis (the process by which blood cells are formed)  
- Up to 100mL per donor can be obtained |
| Peripheral Blood (Leukopak) | - The result of leukapheresis: a specific type of apheresis in which white blood cells are separated from the rest of the blood components |
| Mobilized Peripheral Blood (Leukopak) | - Donor is treated with drug which “mobilizes” cells from the bone marrow to the peripheral blood for easier collection, and in greater quantities  
- Multiple treatment regimens available |
| Whole Blood | - Collected by standard venipuncture  
- Various volumes, containers, anticoagulants available |
| Cord Blood | - Obtained from the umbilical cord during birth  
- Valuable for obtaining cells in a more naïve state |

### Availability

| Bone Marrow | - Fresh whole bone marrow  
- Source for characterized cells including mesenchymal stem cells, CD34+ stem/progenitor cells, and mononuclear cells |
| Peripheral Blood (Leukopak) | - Fresh leukopaks in multiple sizes (volume or total cell count)  
- Source for characterized immune cells |
| Whole Blood | - Whole blood  
- Serum, plasma  
- Erythrocytes |
| Cord Blood | - Source for isolated cryopreserved CD34+ Stem/Progenitor cells |
Donor variety

Robust programs to find exactly the cells you need

FEATURES

• All donations from healthy, consenting donors following IRB-approved protocols
• Donors from multiple geographic regions in the US with different ethnicities (west coast, northeast, mid-Atlantic)
• Dedicated teams to manage, recruit, recall, and support donors
• “Made to order” requests are available (select your specific donor attributes)
• Large donor variety of select cryopreserved cells in stock and ready to ship

BENEFITS

• Access the specific donor attributes you require for your experiments
• Choose multiple donors to account for population diversity
• Obtain cells from a specific donor over time*
• Compliance with ethical and regulatory guidelines
• Start your experiments immediately with in-stock cryopreserved cells

* Every effort within ethical and IRB approved limits will be made to schedule specific donors for recall, but no guarantee can be made regarding availability
Flexible and robust sourcing

- Donor variety
- Tissue variety
- Assays
- Cell variety
Products by tissue type
Peripheral blood leukopak
Blood enriched for leukocytes

Process

- **Leukopaks** are the end product from leukapheresis, a process by which donors supply blood enriched for leukocytes (white blood cells).
- Collections are performed using the Spectra Optia® Apheresis System, from healthy, consenting adults, and following IRB-approved protocols.
- Mononucleated cell-rich blood is continuously collected into a sterile bag using ACD-A as an anticoagulant
  - Roughly 12 donor blood volumes are processed for a full procedure
  - Volume-based leukopaks: full / half / quarter
  - Minimum Cell Count-based leukopaks: 10B/5B/2.5B
- Donor attributes may be selected to suit experimental design
- Donors are compensated for time and effort per NIH guidelines

**CD34+**

<table>
<thead>
<tr>
<th>Typical %</th>
<th>CD3+ Pan T</th>
<th>CD4+ T Cells</th>
<th>CD8+ T Cells</th>
<th>CD14+ Mono</th>
<th>CD19+ B Cells</th>
<th>NK Cells</th>
<th>Granulocytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.01%</td>
<td>60%</td>
<td>32%</td>
<td>23%</td>
<td>11%</td>
<td>7%</td>
<td>5%</td>
<td>10%</td>
</tr>
</tbody>
</table>

**APHERESIS PROCESS**

01 Your whole blood is collected through an intravenous tube one arm.

02 The blood passes through an apheresis machine, which separates the cells from the blood.

03 The cells are collected for storage.

04 The remainder of the blood is returned through an intravenous tube in the other arm.
Peripheral blood products
Leukopaks

Leukapheresis is the process used to collect blood enriched for leukocytes (white blood cells)

Cells are isolated following rigorous SOPs and robust QC/QA processes

Available peripheral blood products

Fresh Leukopaks
- Full/half/quarter pak
- Volume or cell count based

Isolated Cells from Peripheral Blood – available as cyro cells and fresh cells (in US)
- PBMCs
- CD14+ Monocytes
- CD4+ T Cells
- CD8+ T Cells
- Memory T Cells
- Regulatory T Cells
- Naïve T Cells
- B Cells
- NK Cells
- Dendritic Cells
Mobilized Leukopak

Obtain large quantities of CD34+ hematopoietic stem cells

Mobilized leukopaks are the end product from the leukapheresis from donors pre-treated with a mobilization drug (Neupogen® or Mozobil®)

- Mobilization drug causes cells in the bone marrow to be “mobilized” into the circulating peripheral blood. Easier to obtain blood via venipuncture compared to bone marrow aspiration. Additionally, up to 10x more CD34+ cells can be obtained from a mobilized leukopak vs bone marrow aspiration

Donors are healthy, consenting adults, and all protocols are IRB approved.

Multiple treatment regimens available (see table to right)

Large quantities of CD34+ HSCs and CD14+ Monocytes can be obtained from mobilized leukopaks

• Neupogen is a registered trademark of Amgen Inc. Mozobil is a registered trademark of Genzyme Corporation

### Regimen description

<table>
<thead>
<tr>
<th>Regimen</th>
<th>Description</th>
<th>Collection Days Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>RegF</td>
<td>Neupogen® dosed at 10μg/kg/day for 5 days leading up to collection on day 5.</td>
<td>(day 5 and day 6)</td>
</tr>
<tr>
<td>RegH</td>
<td>Neupogen® dosed at 10μg/kg/day for 5 days leading up to collection. Mozobil® dosed at 240 μg/kg/day on days 4 and 5</td>
<td>(day 5 and day 6)</td>
</tr>
<tr>
<td>MozA</td>
<td>Mozobil® dosed at 20mg/mL, 1.2 mL single dose</td>
<td>Single collection on day 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>CD34+ HSCs</th>
<th>CD3+ Pan T Cells</th>
<th>CD4+ T Cells</th>
<th>CD8+ T Cells</th>
<th>CD14+ Mono</th>
<th>CD19+ B Cells</th>
<th>NK Cells</th>
<th>Granulocytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical %</td>
<td>1%</td>
<td>15%</td>
<td>10%</td>
<td>8%</td>
<td>25%</td>
<td>5%</td>
<td>5%</td>
<td>40%</td>
</tr>
</tbody>
</table>
Mobilized Blood Products

Mobilized leukopaks

Bone Marrow

Leukapheresis is performed

Fresh Mobilized Leukopak

Donor treated with mobilization agent

Apheresis

Cells are isolated following rigorous SOPs and robust QC/QA processes

Available Mobilized Blood Products

Fresh Mobilized Leukopaks

- Available as full leukopaks
- Multiple treatment options
  - RegF
  - RegH
  - MozA

Isolated Cells from Mobilized Blood

- CD34+ Stem/Progenitor Cells
- CD14+ Monocytes
Bone Marrow Products

Available Bone Marrow Products

Fresh Bone Marrow
• Multiple Volumes, up to 100mL per donor

Isolated Cells from Bone Marrow
• Mesenchymal Stem Cells
• CD34+ Stem/Progenitor Cells
• Mononuclear Cells

Bone Marrow Aspiration

Cells are isolated following rigorous SOPs and robust QC/QA processes

Lonza Walkersville, Inc. | © 2019
Cord Blood Products

01 Baby is born with umbilical cord and placenta attached.

02 After the cord is tied and cut, some blood is left in the blood vessels of the placenta and cord.

03 This cord bleed is extracted from the umbilical cord using a special collection bag.

Cells are isolated following rigorous SOPs and robust QC/QA processes.

Available Cord Blood Products

- Isolated Cells from Cord Blood
  - CD34+ Stem/Progenitor Cells
  - Mononuclear Cells
  - CD14+ Monocytes
  - CD3+ T Cells
  - CD4+ T Cells
  - CD8+ T Cells
  - Naive T Cells
  - NK Cells

Lonza Walkersville, Inc. | © 2019
Whole blood products

Available Whole Blood Products

- Whole blood in
  - Multiple container types
  - Multiple anticoagulants
  - Multiple volumes
- Plasma
- Serum
- Platelets
- Erythrocytes
Applications
Key applications / research areas

- Regenerative medicine (MSCs, CD34+ stem cells)
- Immunogenicity screening (PBMCs, Monocytes, Fresh Blood)
- Immuno-oncology (T Cells, B Cells)
- CRISPR (T Cells, NK Cells)
- STING (T Cells)
- Cell & Gene Therapy (T Cells, Dendritic Cells, NK Cells)
- Humanized mice (CD34+ Stem Cells / PBMCs)
- Drug Clearance (PBMCs)
- Large-quantity cell isolation (Leukopaks)
Resources

• For additional product information and pricing visit:
  https://bioscience.lonza.com/hematopoietic-products

• Find citations and methods from peer-reviewed publications in our knowledge centers:
  https://knowledge.lonza.com
  https://bioscience.lonza.com/immuno-and-hematopoietic-knowledge-center

• For questions and support, contact our Scientific Support Team:
  https://bioscience.lonza.com/contact/lonza
Thank You