

Hematopoiesis

from pluripotent stem cells to
mature, differentiated,
cellular effectors of immunity
and more

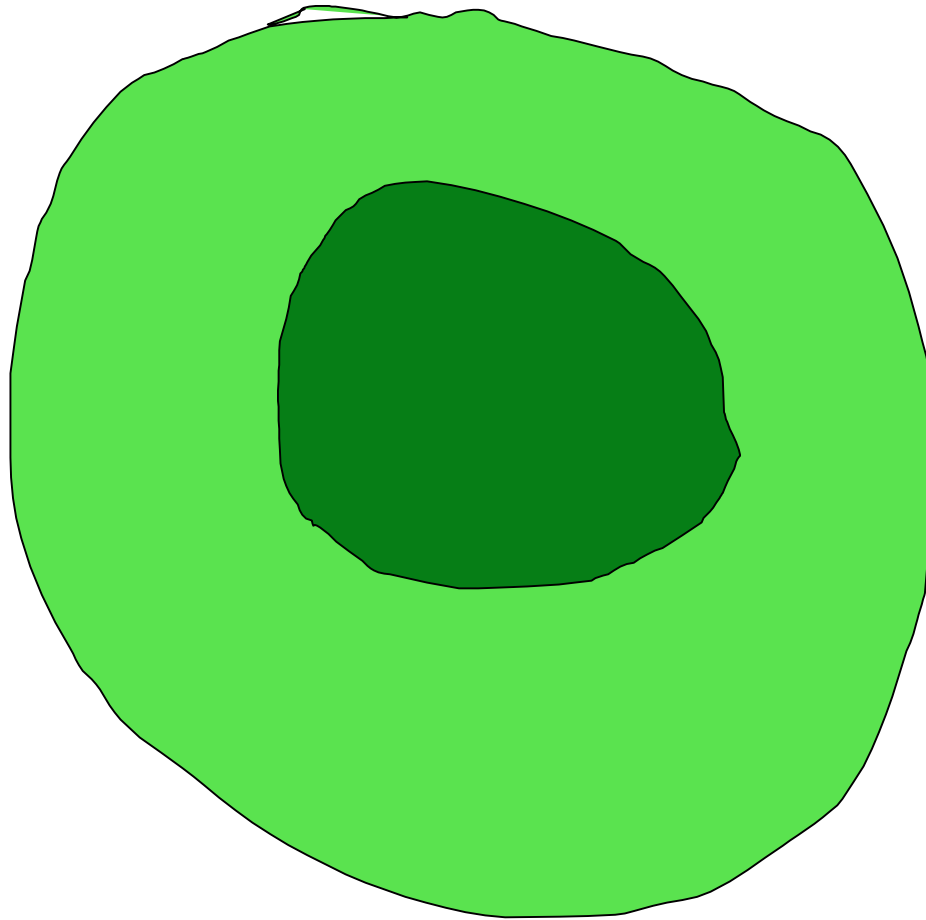
Richard A. Poirier for HHMI/Harvard *Immunology* Summer Project 2004

Click on one of the following effector cells to see the sequence of different cells that lead to its production

- [T_h- Helper Cell](#)
- [B Cell](#)
- [Macrophage](#)
- [Neutrophil](#) (alternative path)
- [Mast Cell](#)
- [Platelets](#)

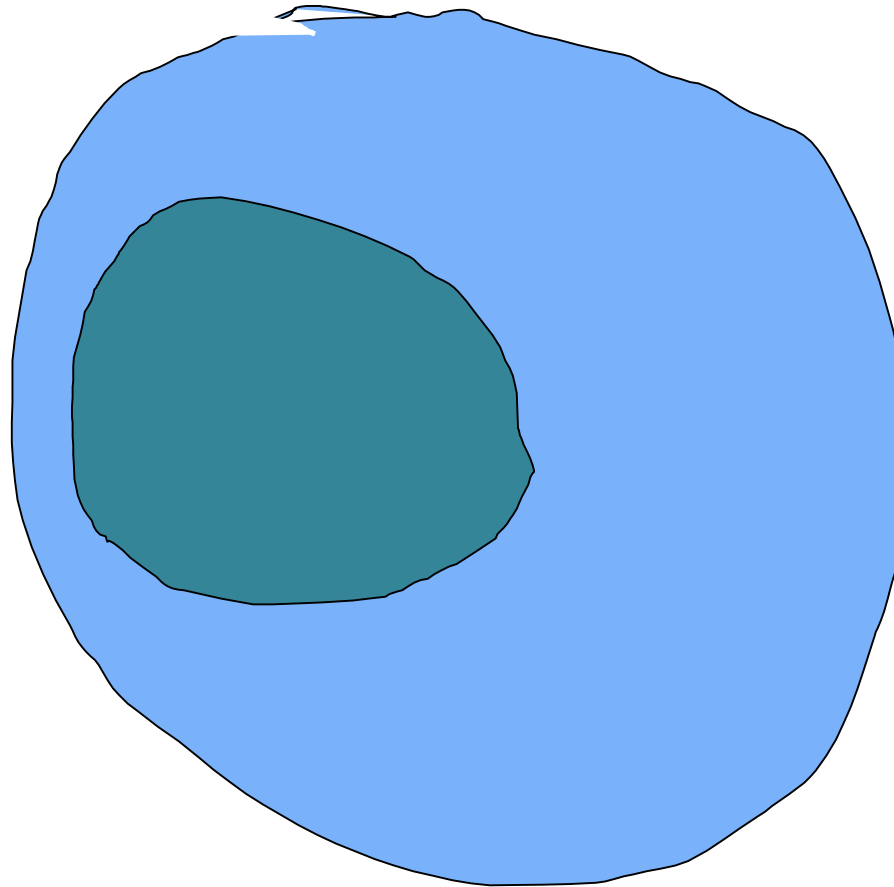
- [T_c Cytotoxic Cell](#)
- [Dendritic Cell](#)
- [Neutrophil](#)
- [Eosinophil](#)
- [Basophil](#)
- [Erythrocyte](#)

T - helper cell pathway



Pluripotent Stem Cell

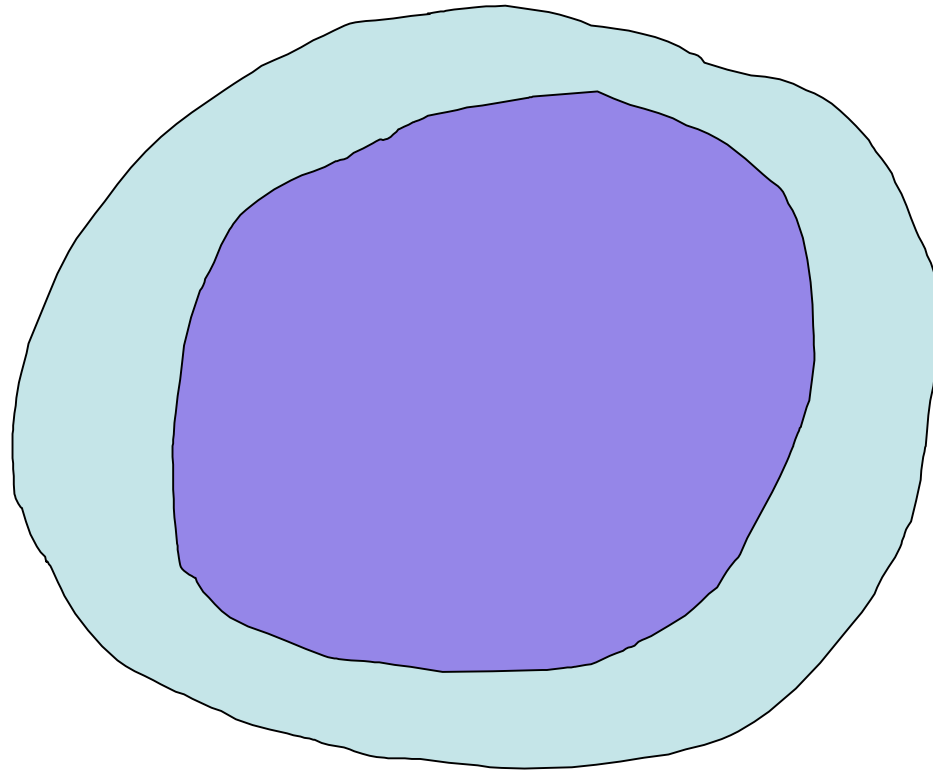
This is the undifferentiated precursor to all of the blood cells, red and white, and other immune effector cells, and platelets.



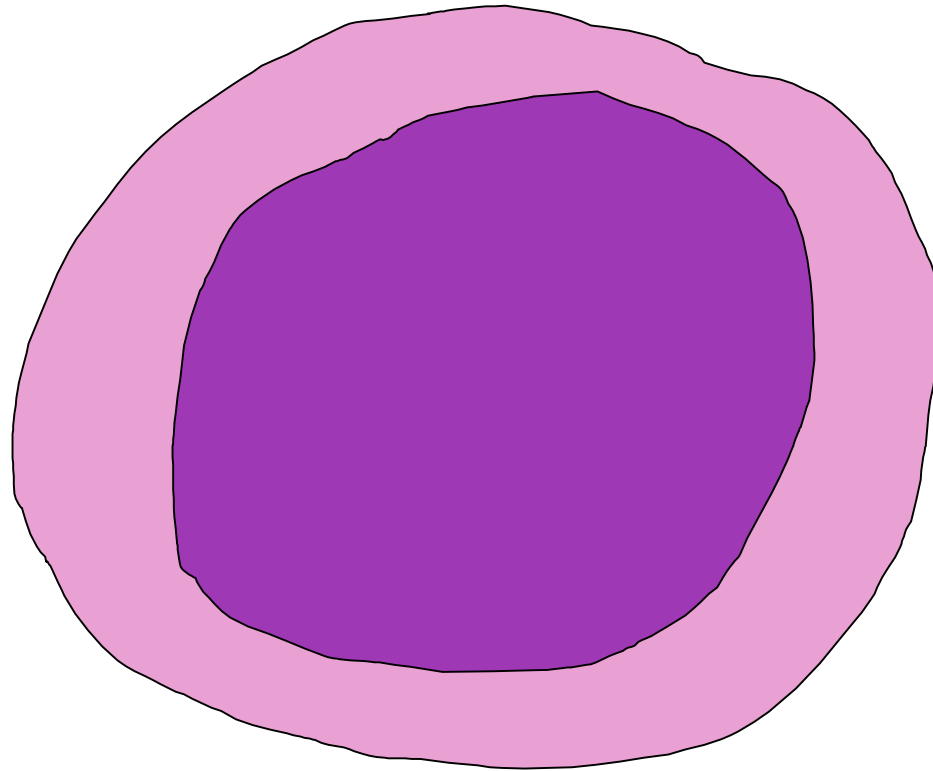
Lymphoid Stem Cell

Daughter cell of the Pluripotent Stem Cell, this cell will divide to produce progenitors to either B cell or T cell lines

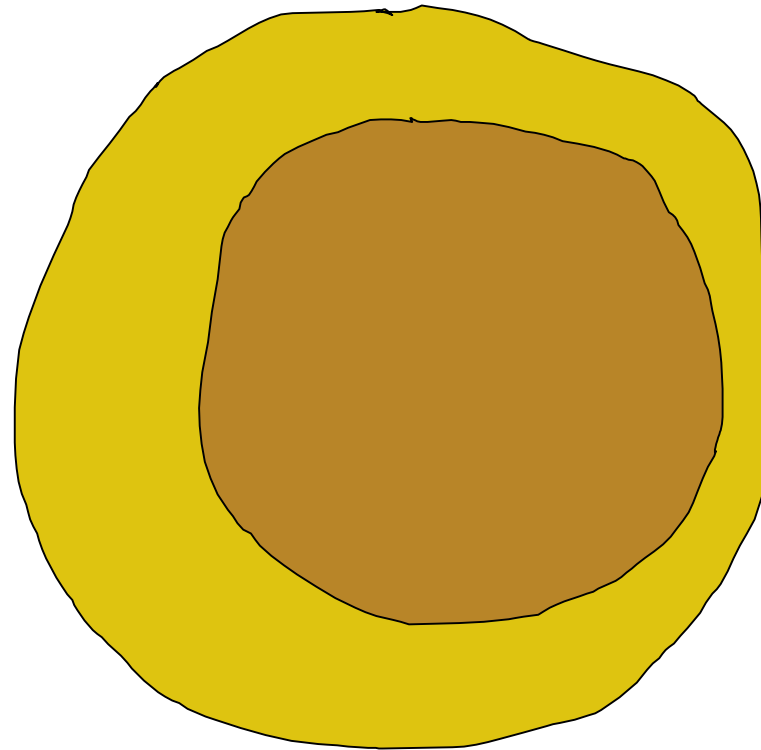
.



T cell progenitor leaves the bone marrow and settles in the thymus; will produce Thymocyte cells in the thymus which can, in turn differentiate into T helper cells, T killer cells, or T memory cells



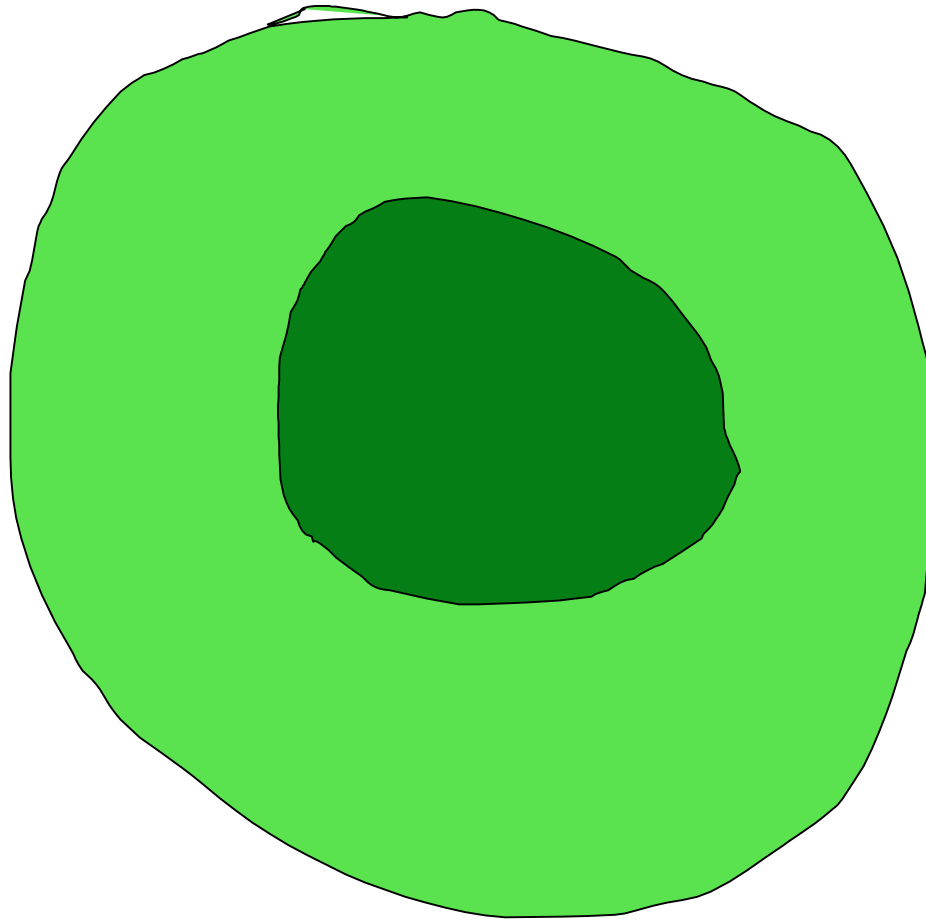
The Thymocyte is located in the thymus and divides to produce mature T effector cells.....
 T_h (helper) T_c (cytotoxic-killer) or T_m (memory)



T_h (helper) cell... when activated by an Antigen Presenting Cell like a macrophage with antigen, the T_h cell will induce rapid growth of white blood cells which help fight infection

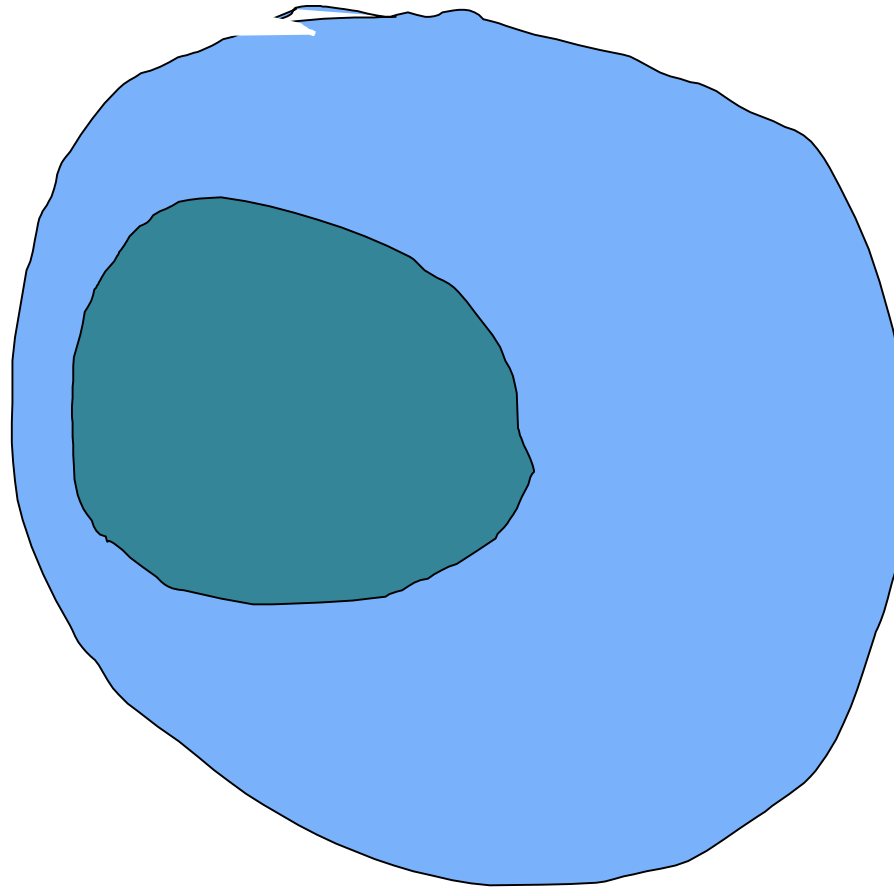
Click [HERE](#) to return to menu

Tc (cytotoxic/"killer") cell pathway



Pluripotent Stem Cell

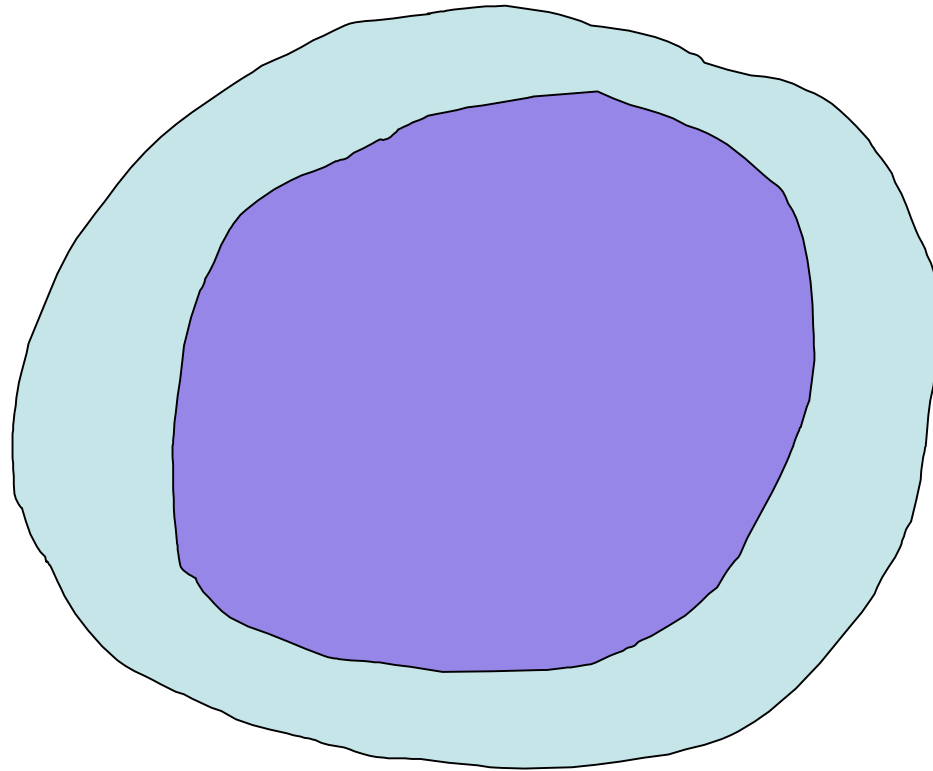
This is the undifferentiated precursor to all of the blood cells, red and white, and other immune effector cells, and platelets.



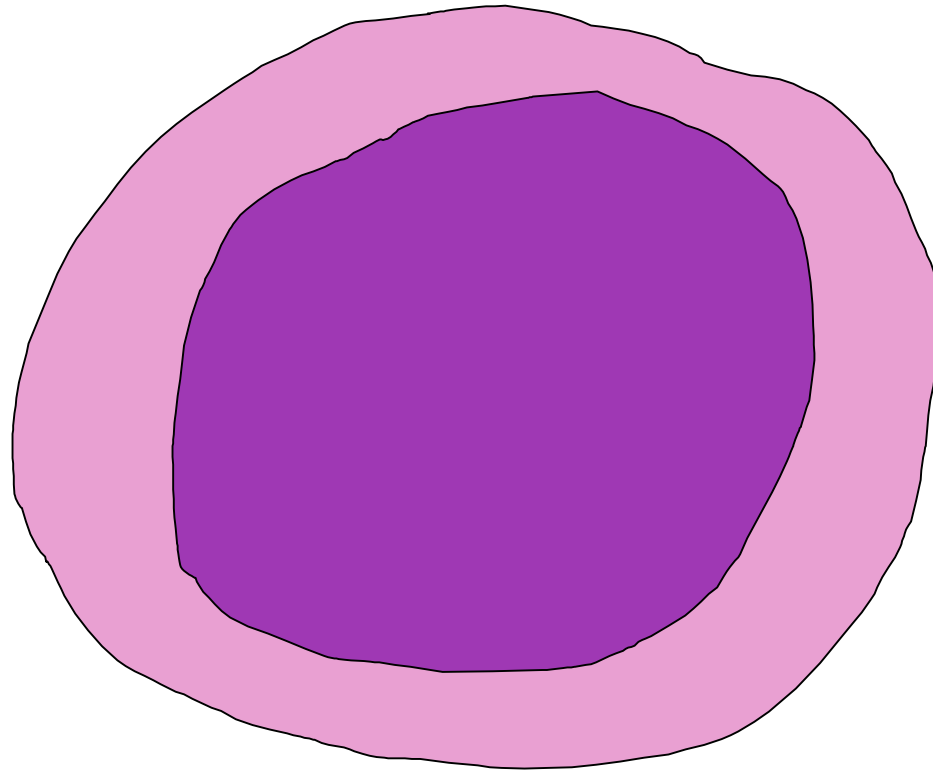
Lymphoid Stem Cell

Daughter cell of the Pluripotent Stem Cell, this cell will divide to produce progenitors to either B cell or T cell lines

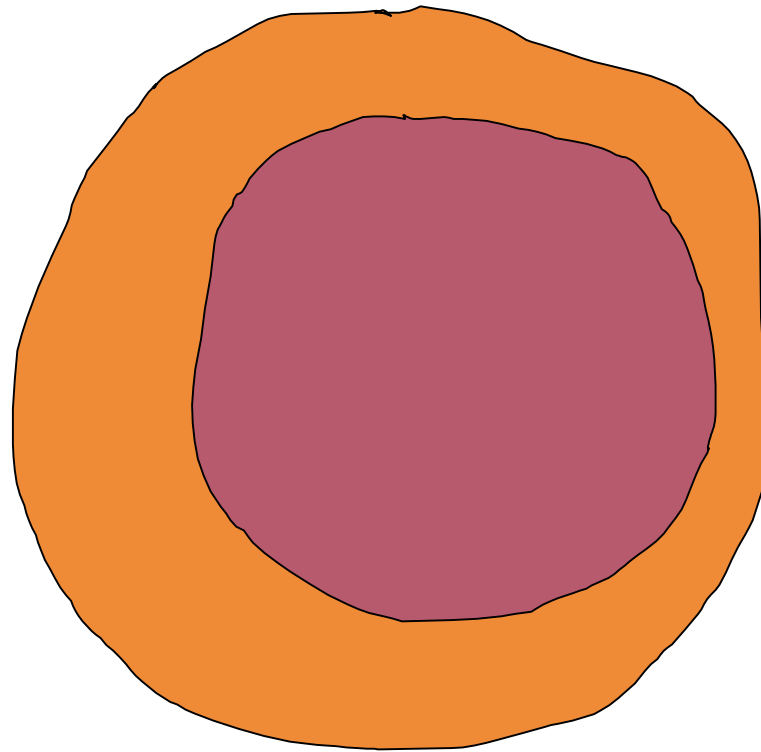
.



T cell progenitor leaves the bone marrow and settles in the thymus; will produce Thymocyte cells in the thymus which can, in turn differentiate into T helper cells, T killer cells, or T memory cells



The Thymocyte is located in the thymus and divides to produce mature T effector cells.....
 T_h (helper) T_c (cytotoxic-killer) or T_m (memory)

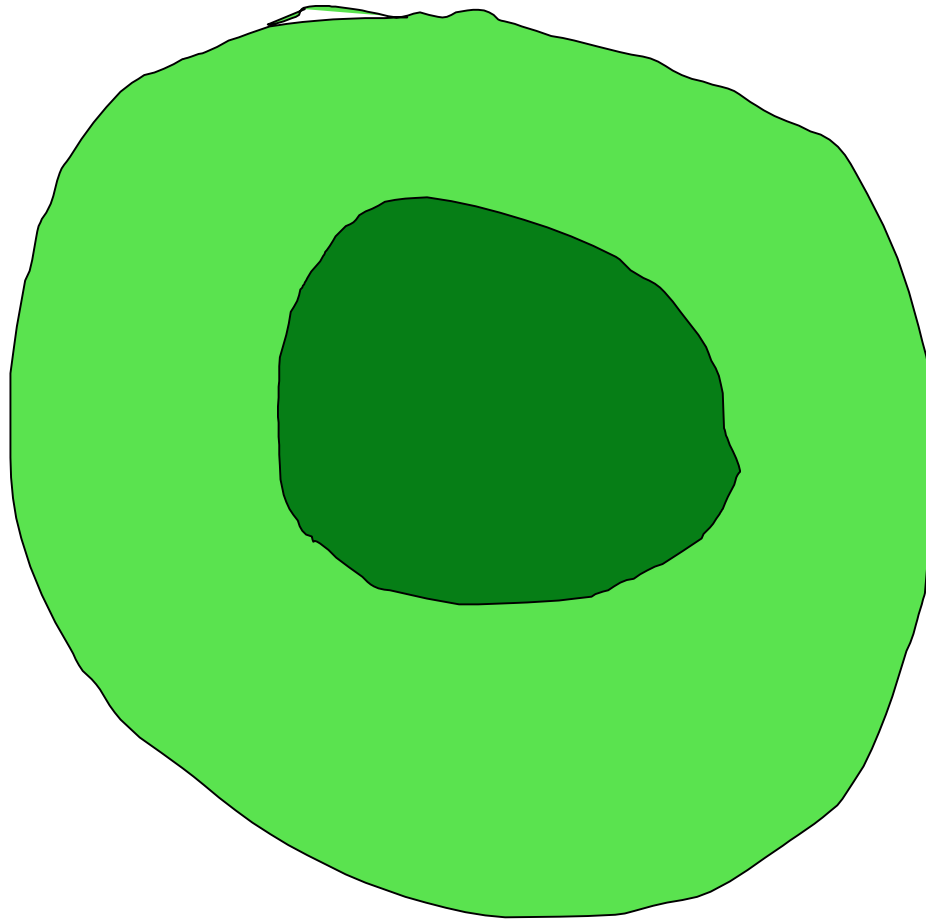


T_c (cytotoxic or “killer”) Cells...

Sometimes called CTLs (cytotoxic T lymphocytes, these may recognize infected “self” cells and destroy them.

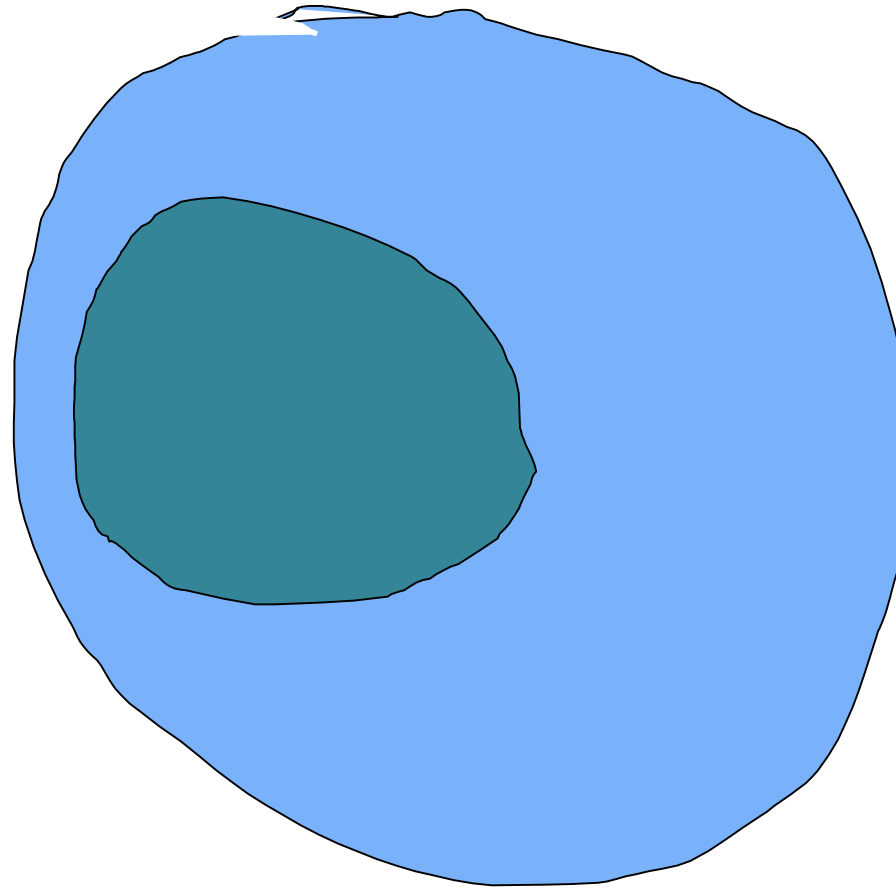
Click [HERE](#) to return to menu

B cell pathway



Pluripotent Stem Cell

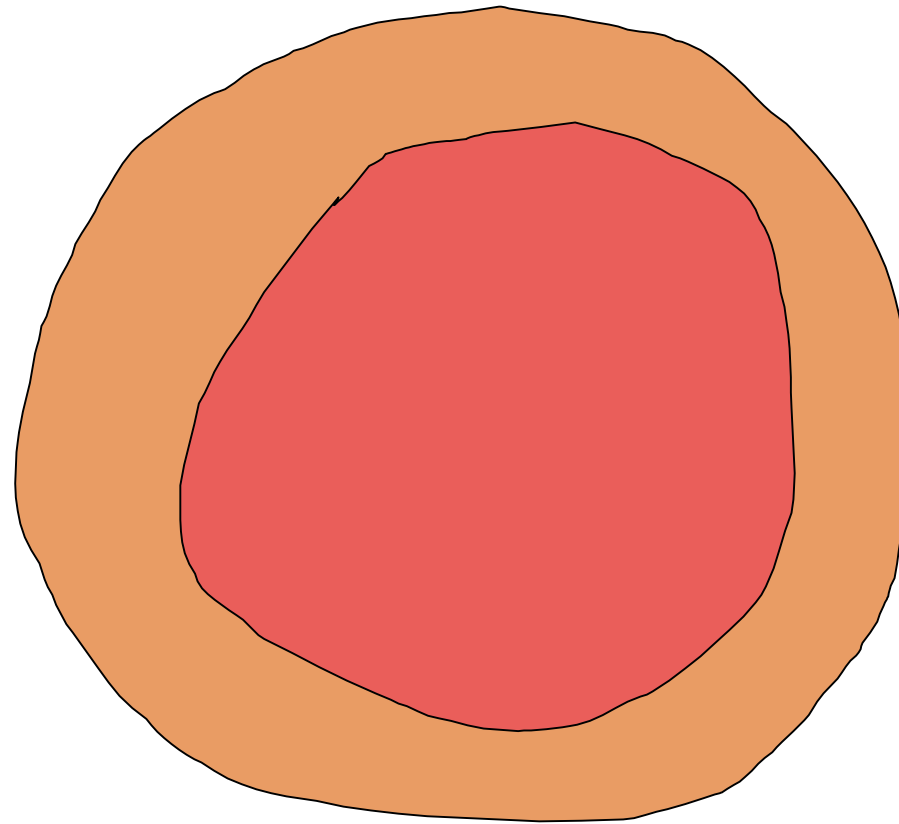
This is the undifferentiated precursor to all of the blood cells, red and white, and other immune effector cells, and platelets.



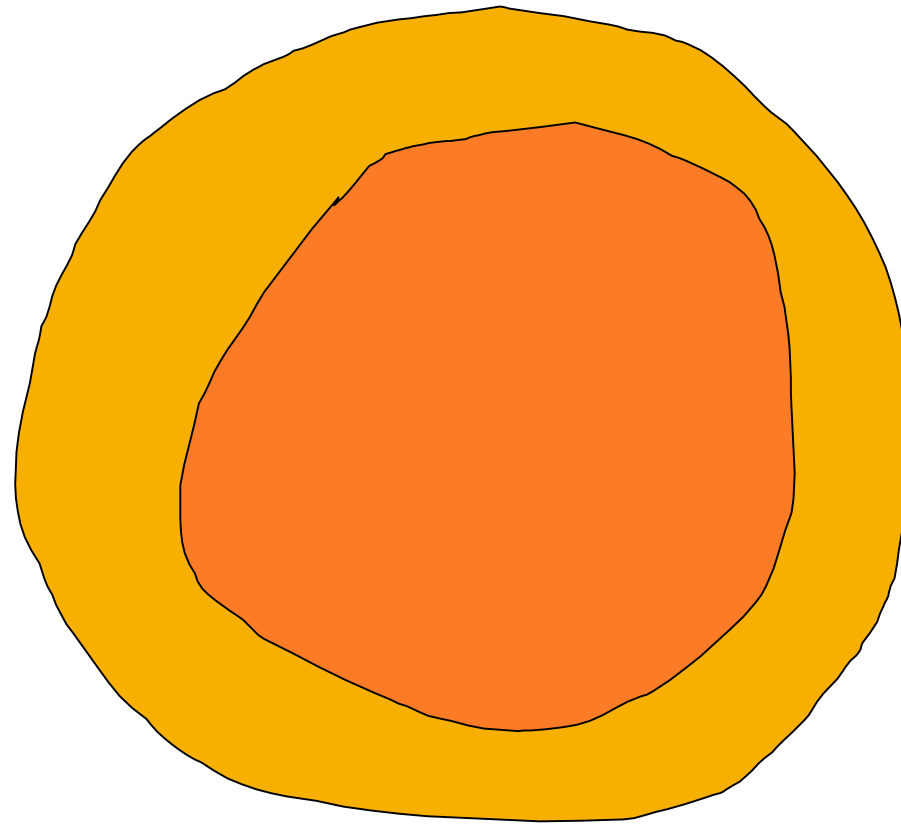
Lymphoid Stem Cell

Daughter cell of the Pluripotent Stem Cell, this cell will divide to produce progenitors to either B cell or T cell lines

.



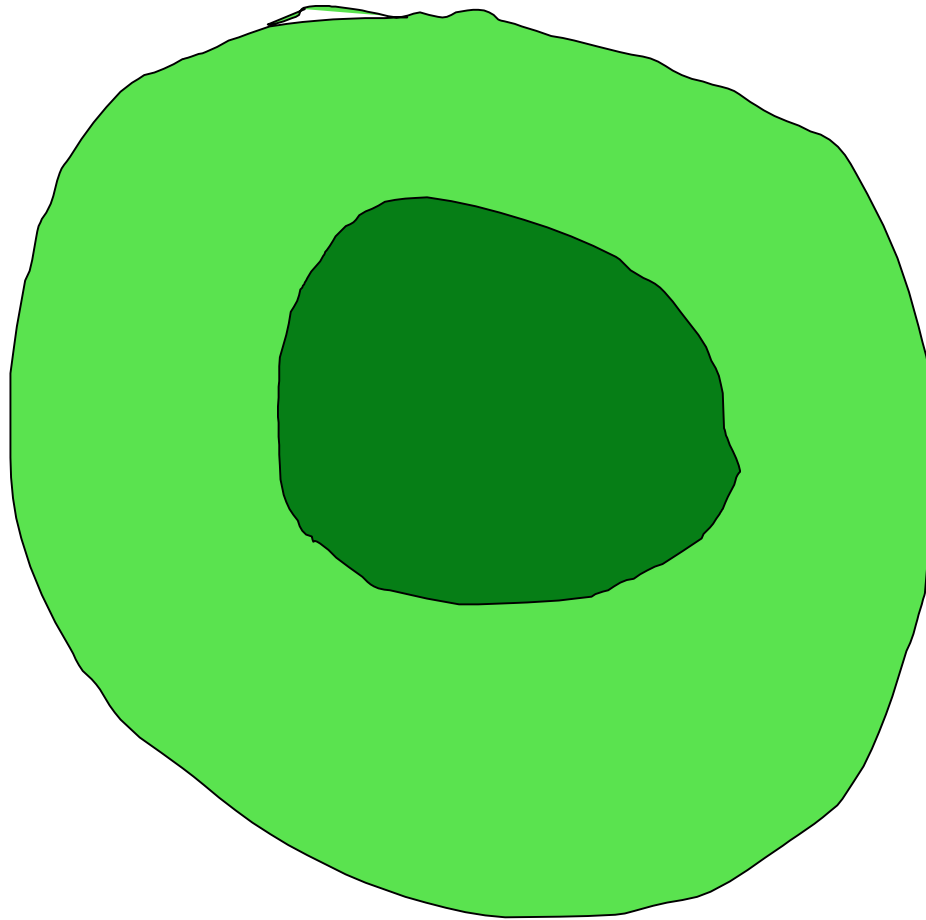
B Cell progenitor...found in the bone marrow of higher vertebrates and the Bursa of Fabricius in birds, these cells will produce antibody producing B cells.



B Cells... these are found in the blood and ,
when activated will produce antibodies against
particular antigens. Each cell produces antigen
specific antibodies of only one type.

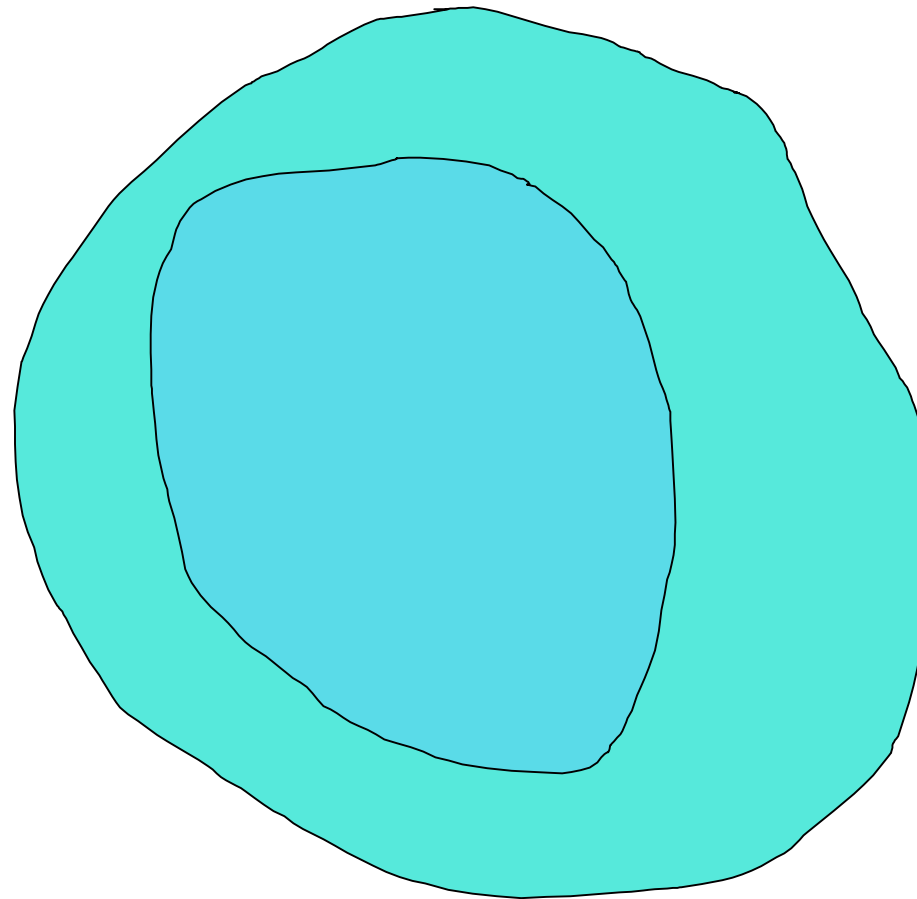
Click [HERE](#) to return to menu

Dendritic cell pathway



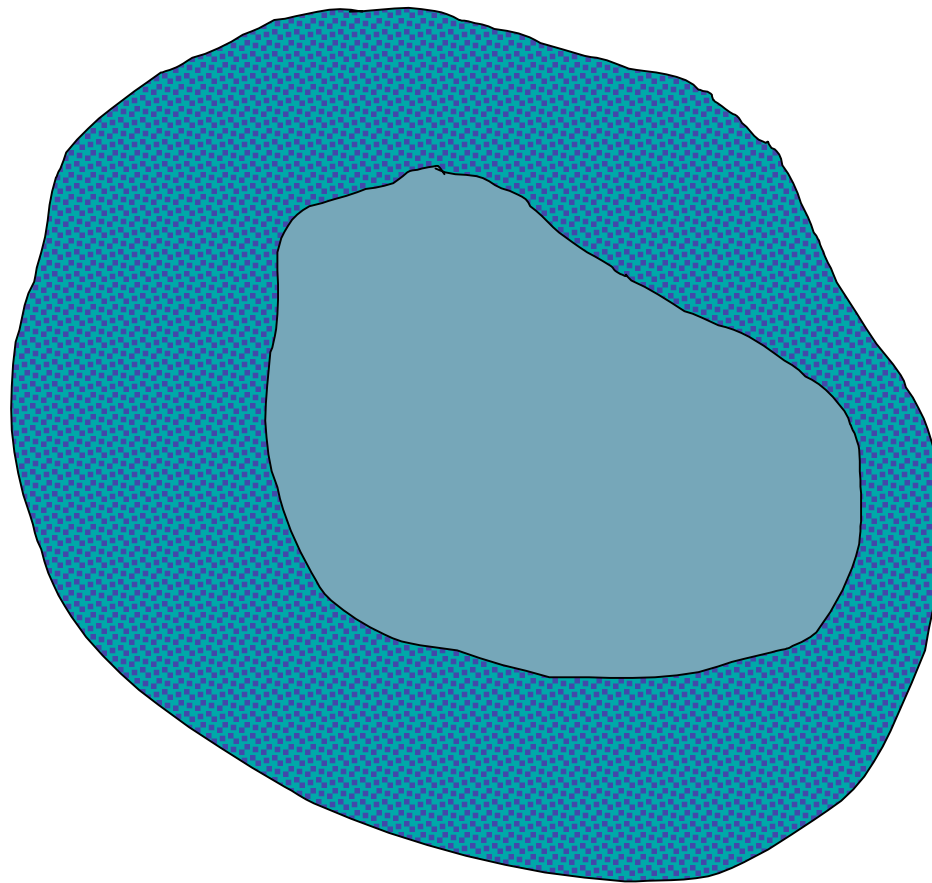
Pluripotent Stem Cell

This is the undifferentiated precursor to all of the blood cells, red and white, and other immune effector cells, and platelets.

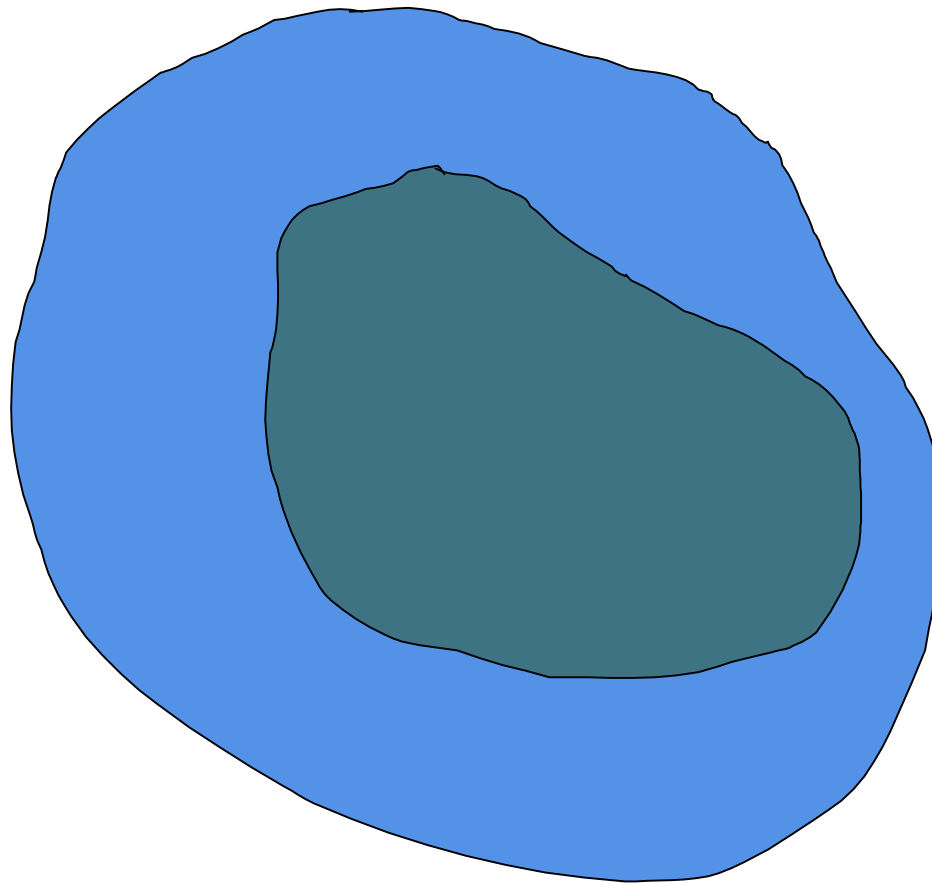


Myeloid Stem Cells... daughters of the Pluripotent Stem Cells, these are the progenitors of a host of specialized white blood cells (WBCs), red blood cells (RBCs) and the blood platelets which are crucial to blood clotting.

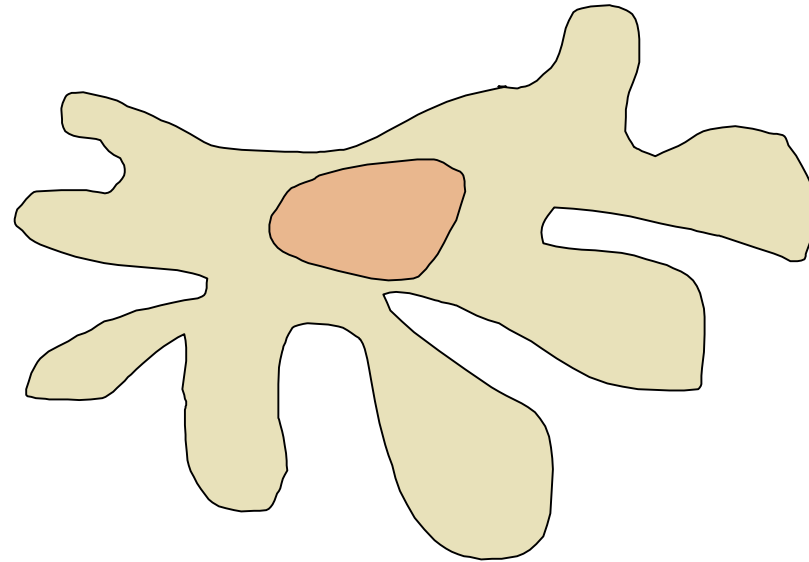
Granulocyte -Monocyte Progenitor cells
can differentiate into monocytes or neutrophils



Monocytes... act as antigen presenting cells (APCs), as Antibody-Dependent Cytotoxic Cells (ADCC) , and promote inflammation.

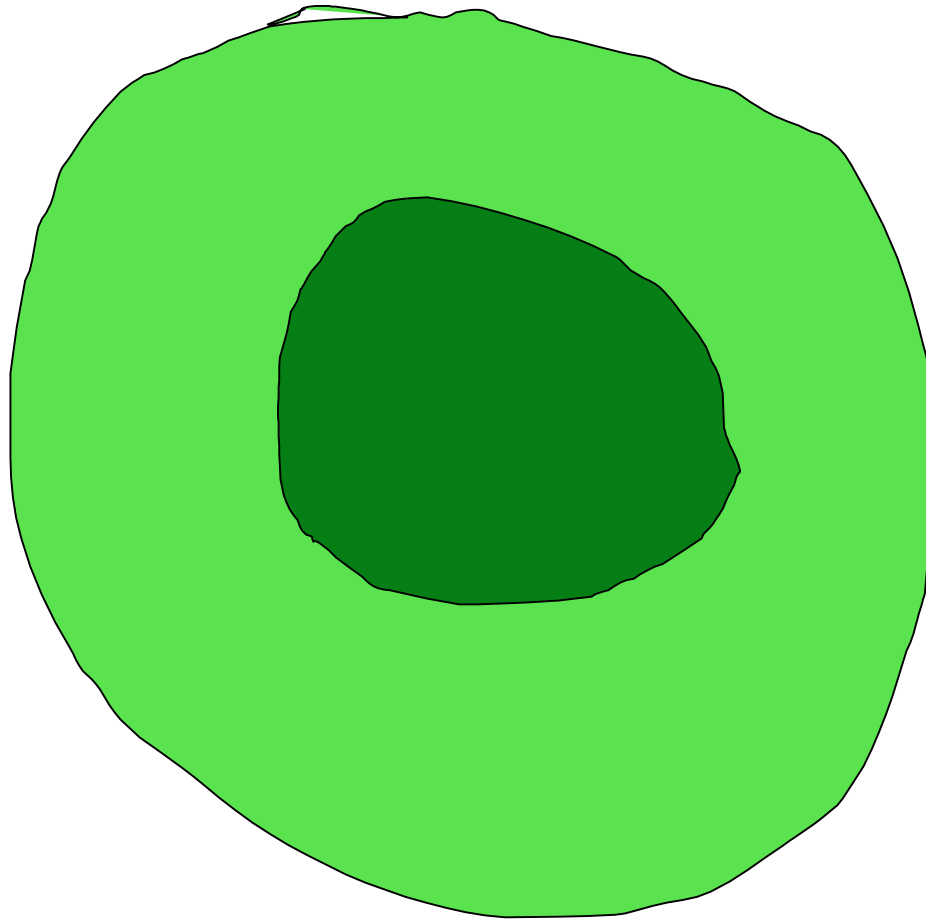


Dendritic Cell... like the macrophage, this cell is phagocytic it inhabits the tissues looking for foreign intruders to devour.



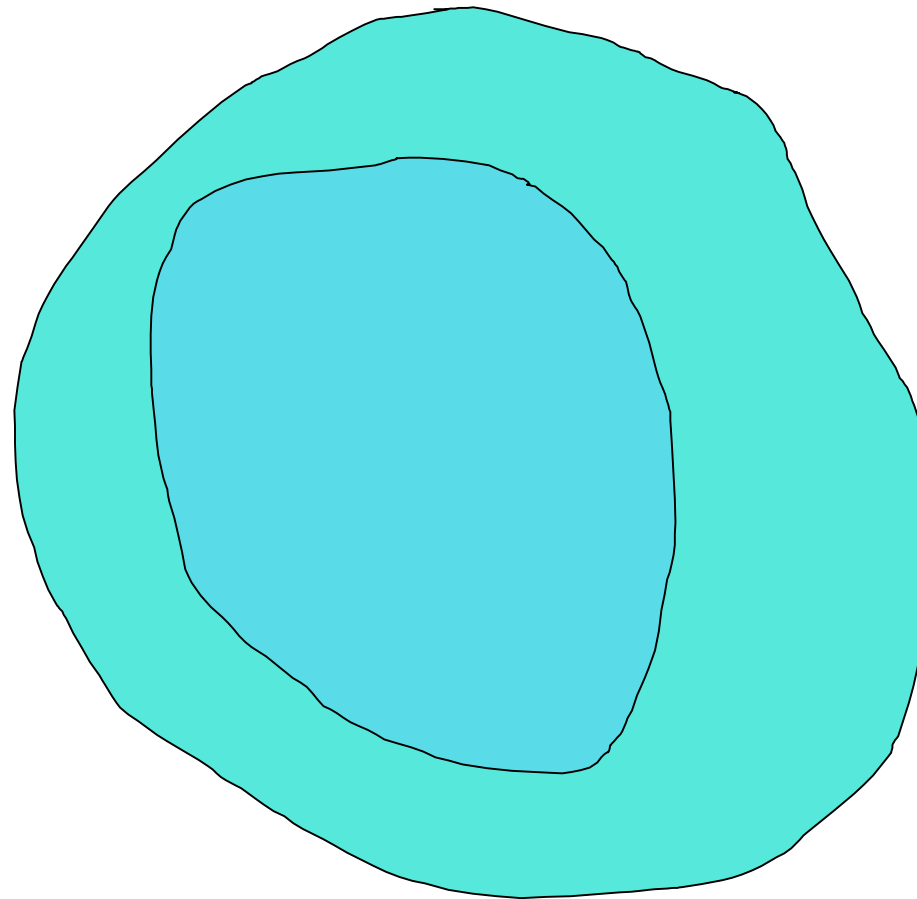
Click [HERE](#) to return to menu

Macrophage pathway



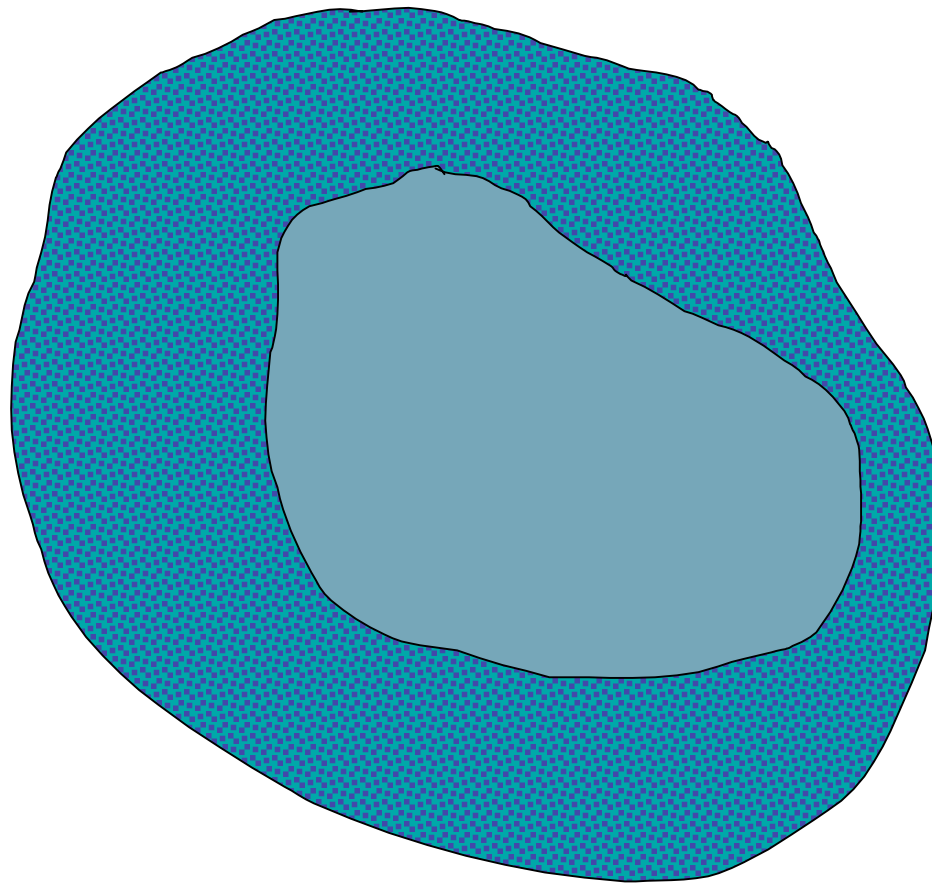
Pluripotent Stem Cell

This is the undifferentiated precursor to all of the blood cells, red and white, and other immune effector cells, and platelets.

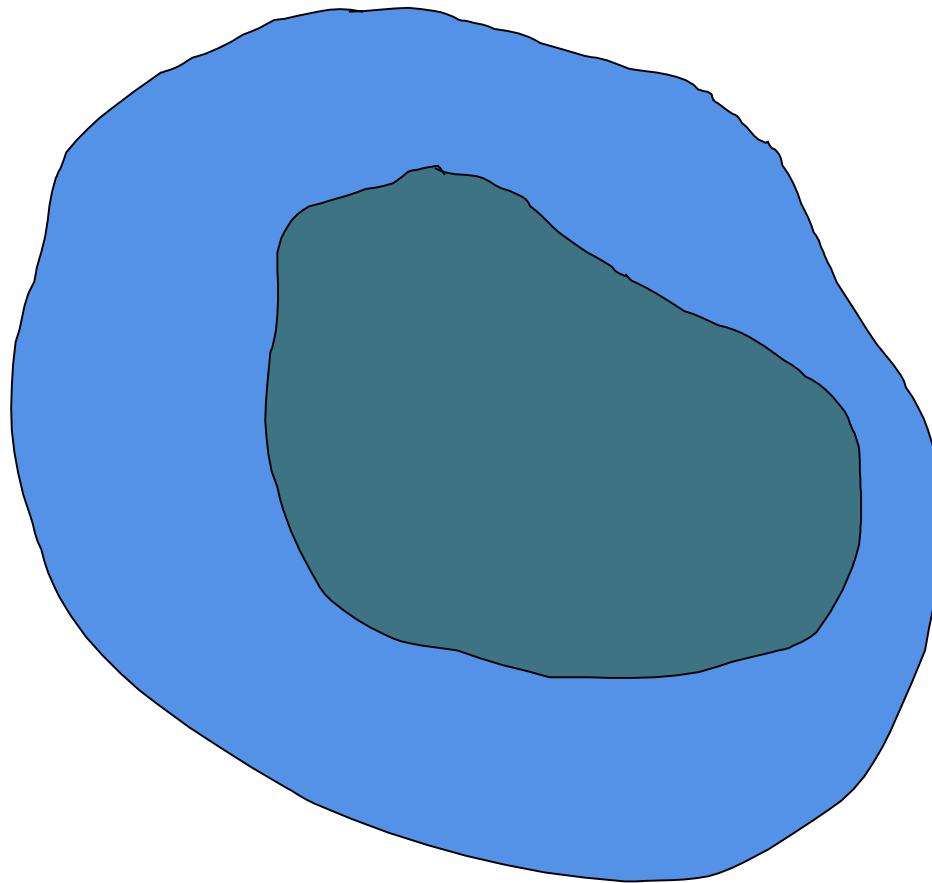


Myeloid Stem Cells... daughters of the Pluripotent Stem Cells, these are the progenitors of a host of specialized white blood cells (WBCs), red blood cells (RBCs) and the blood platelets which are crucial to blood clotting.

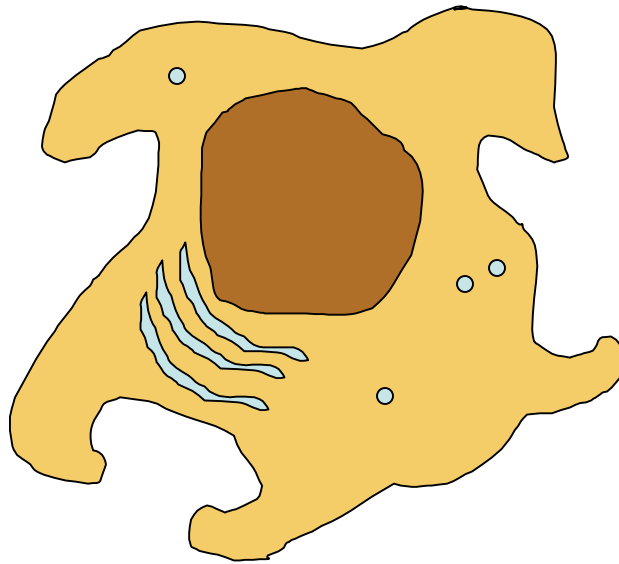
Granulocyte -Monocyte Progenitor cells
can differentiate into monocytes or neutrophils



Monocytes . . . act as antigen presenting cells (APCs), as Antibody-Dependent Cytotoxic Cells (ADCC) , and promote inflammation.

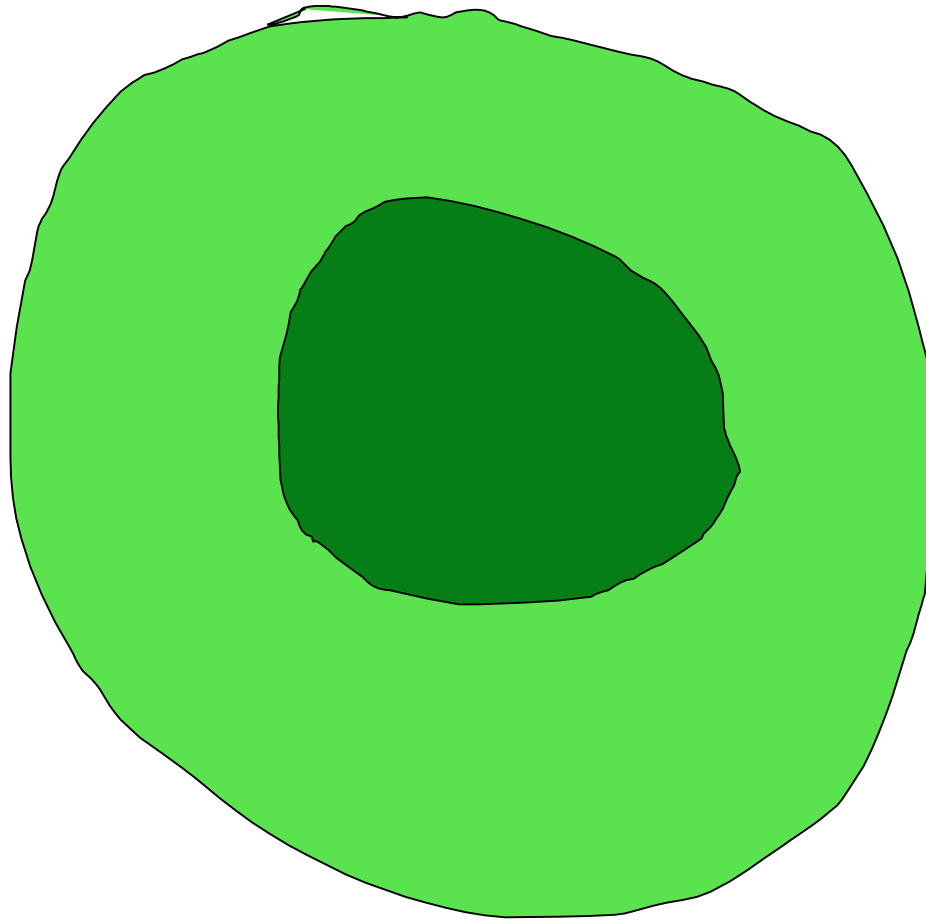


Macrophage...functions as antigen presenting cell (APC), in inflammation, and in ADCC (antibody-dependent cell-mediated cytotoxicity)



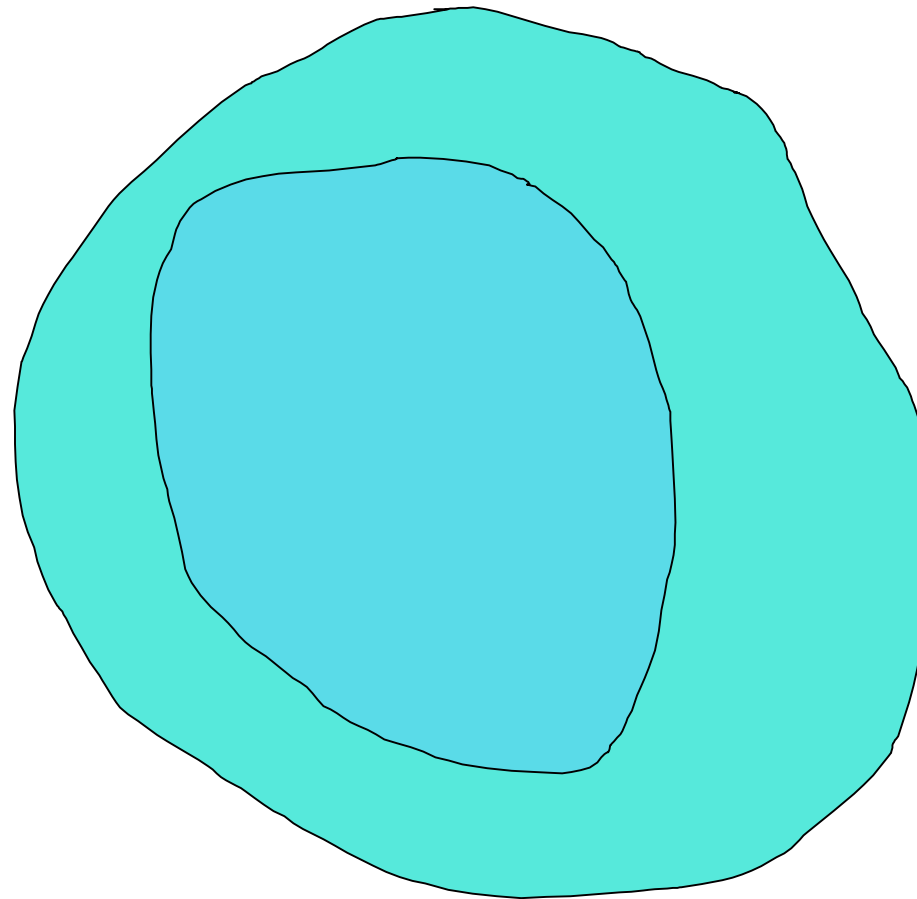
Click [HERE](#) to return to menu

Neutrophil Pathway



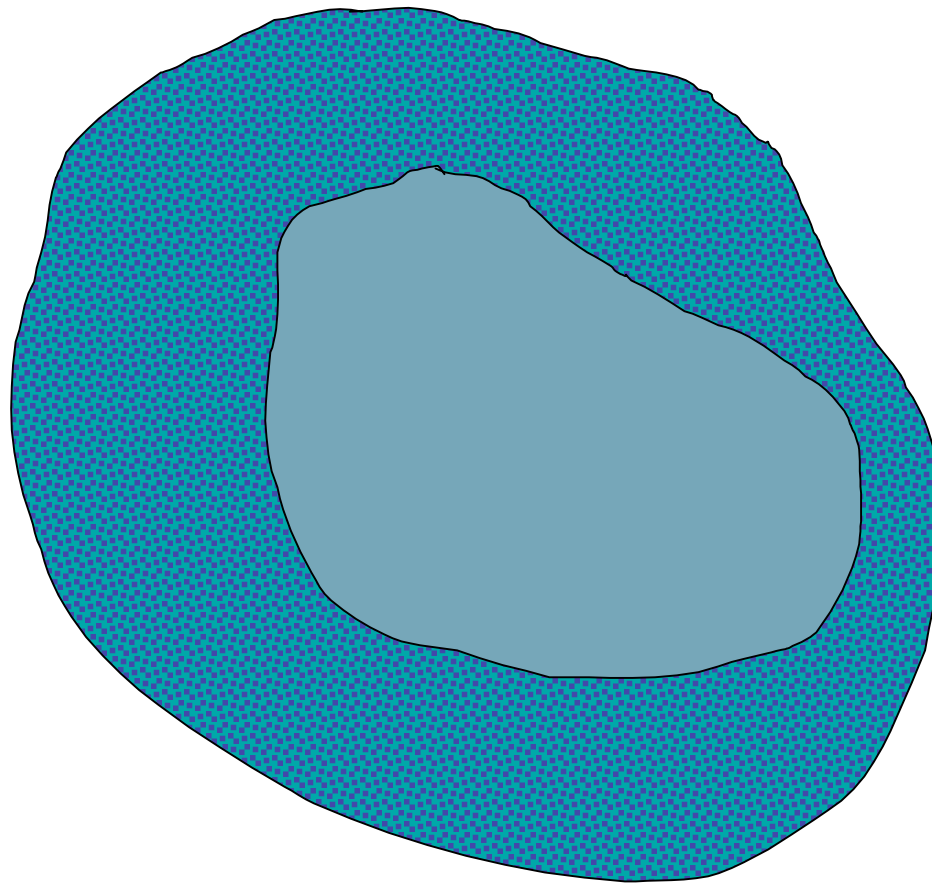
Pluripotent Stem Cell

This is the undifferentiated precursor to all of the blood cells, red and white, and other immune effector cells, and platelets.

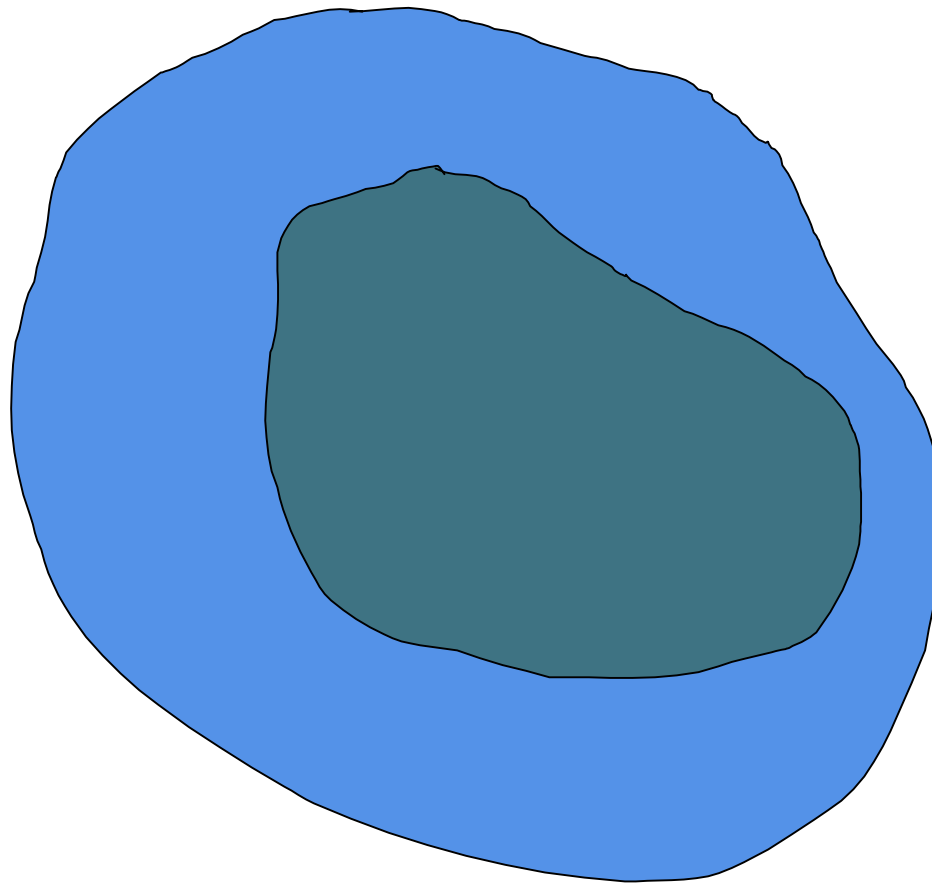


Myeloid Stem Cells... daughters of the Pluripotent Stem Cells, these are the progenitors of a host of specialized white blood cells (WBCs), red blood cells (RBCs) and the blood platelets which are crucial to blood clotting.

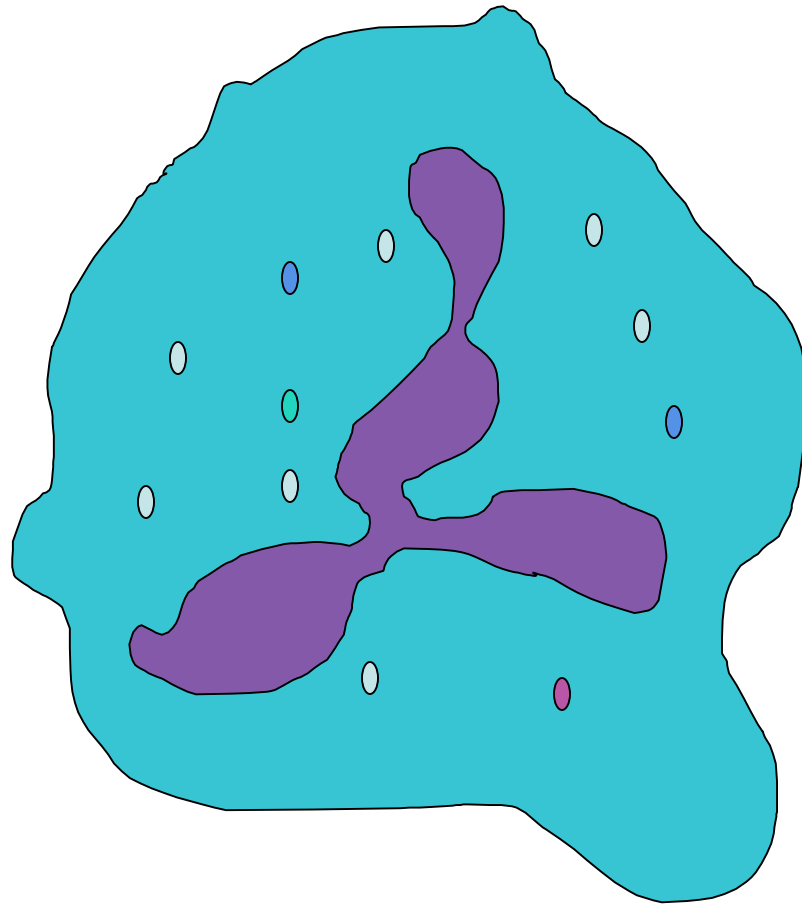
Granulocyte -Monocyte Progenitor cells
can differentiate into monocytes or neutrophils



Monocytes... act as antigen presenting cells (APCs), as Antibody-Dependent Cytotoxic Cells (ADCC) , and promote inflammation.

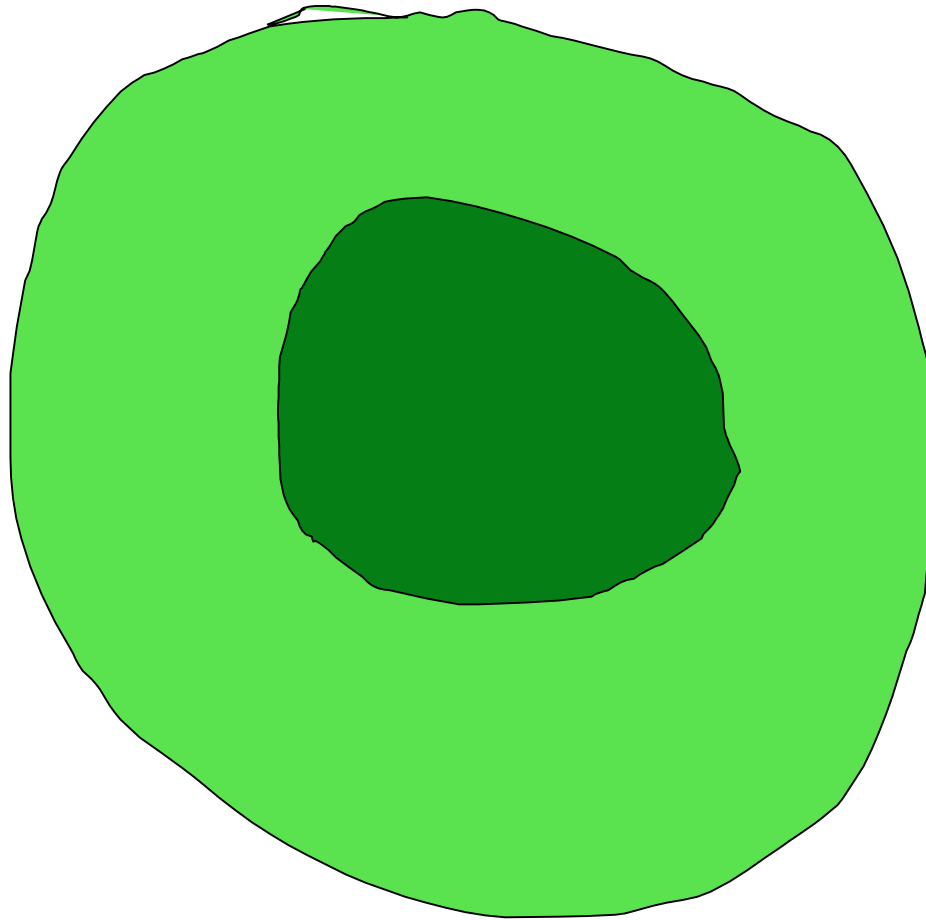


Neutrophils . . . function in antimicrobial activity, inflammation response, and antibody-dependent, cell-mediated cytotoxicity (ADCC)



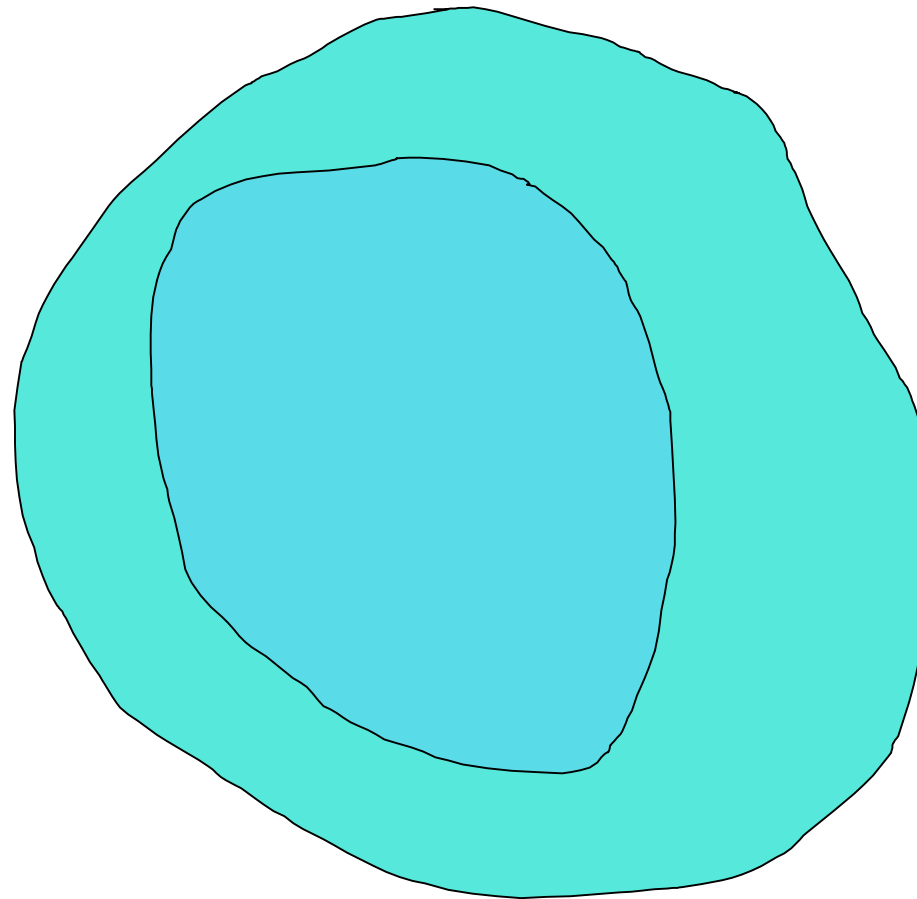
Click [HERE](#) to return to menu

Alternative Neutrophil pathway



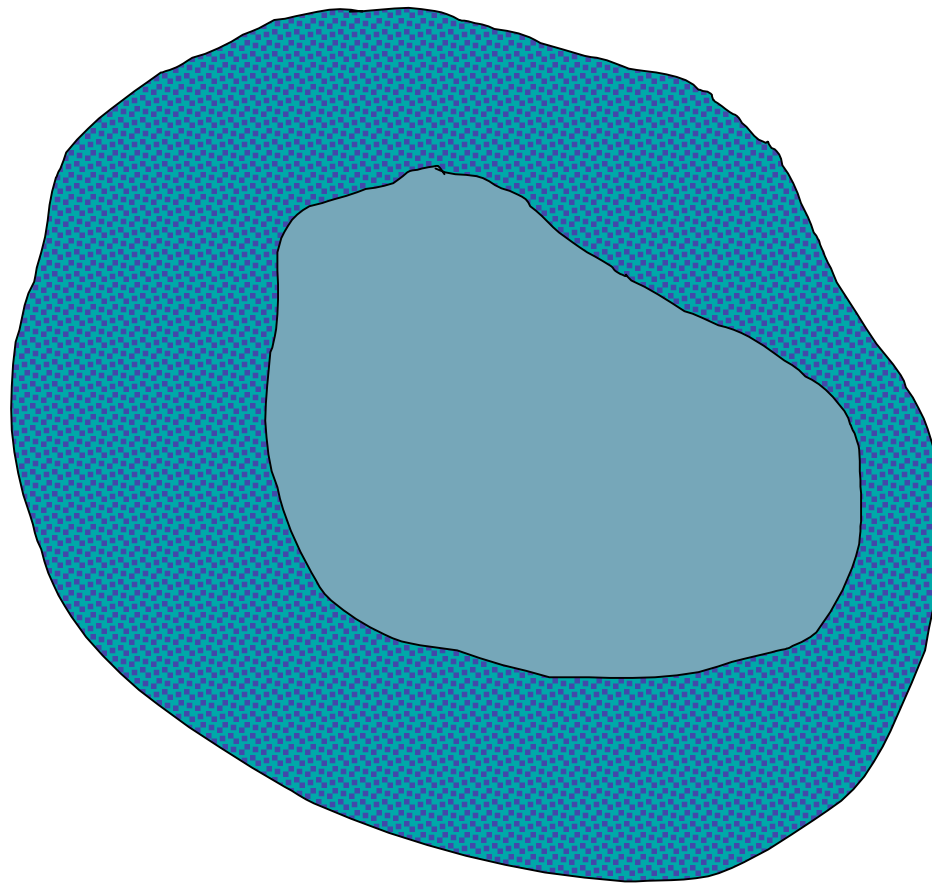
Pluripotent Stem Cell

This is the undifferentiated precursor to all of the blood cells, red and white, and other immune effector cells, and platelets.

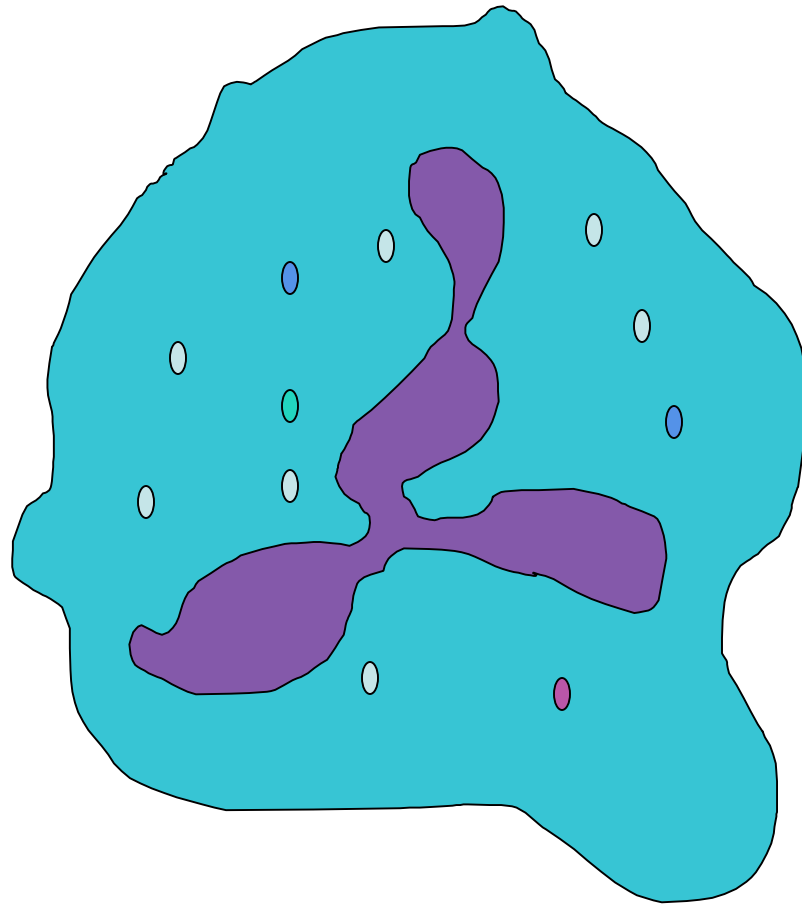


Myeloid Stem Cells... daughters of the Pluripotent Stem Cells, these are the progenitors of a host of specialized white blood cells (WBCs), red blood cells (RBCs) and the blood platelets which are crucial to blood clotting.

Granulocyte -Monocyte Progenitor cells
can differentiate into monocytes or neutrophils

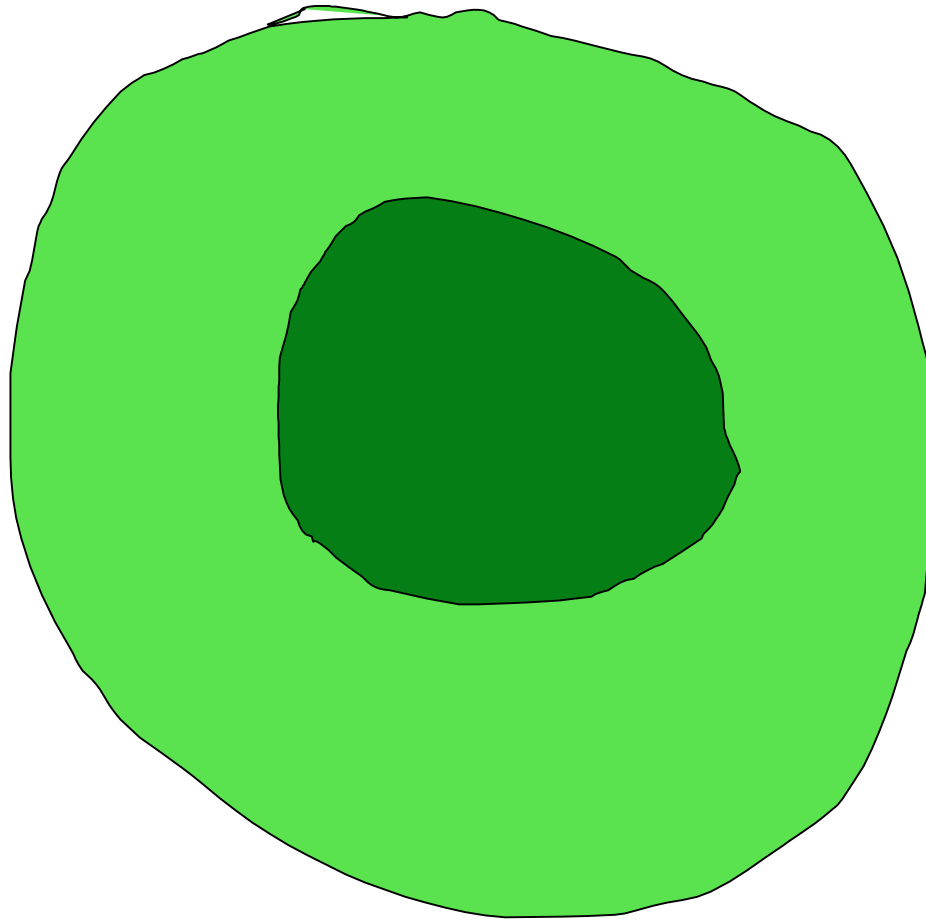


Neutrophils . . . function in antimicrobial activity, inflammation response, and antibody-dependent, cell-mediated cytotoxicity (ADCC)



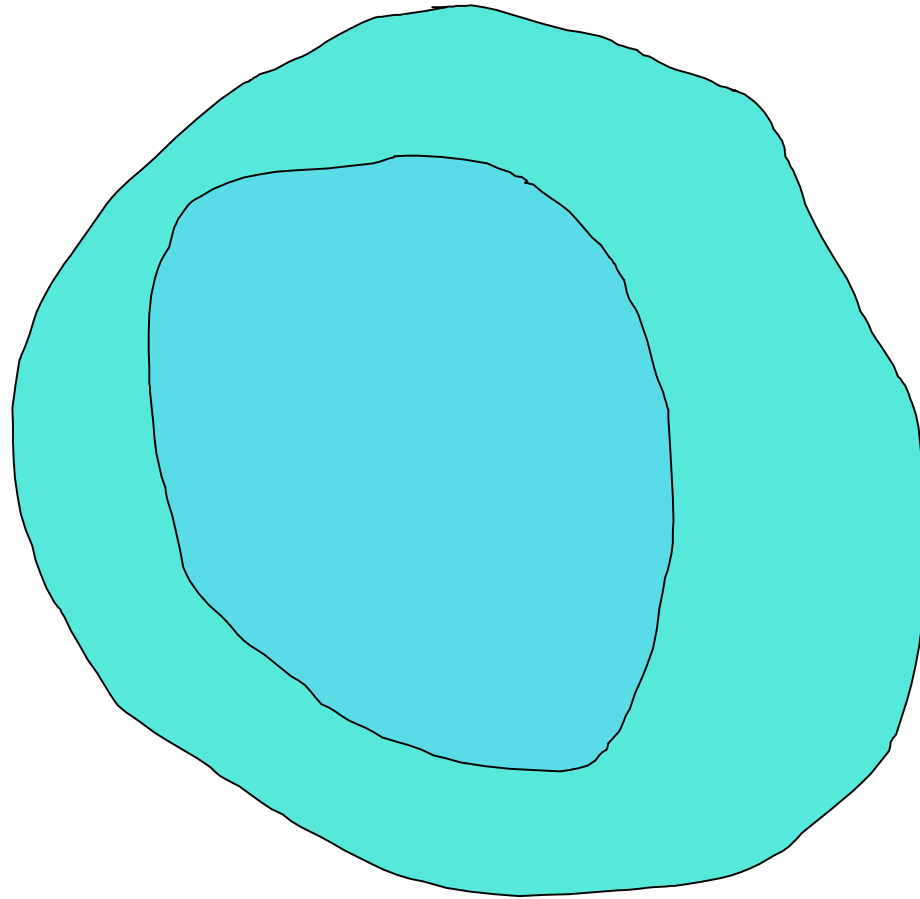
Click [HERE](#) to return to menu

Eosinophil Pathway



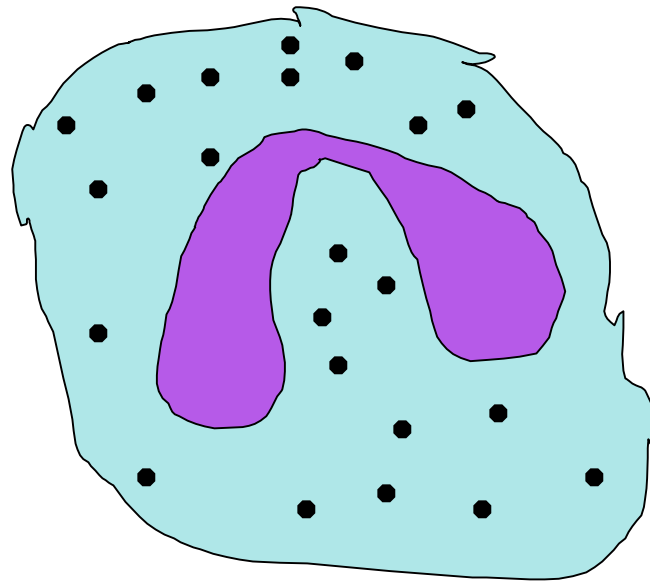
Pluripotent Stem Cell

This is the undifferentiated precursor to all of the blood cells, red and white, and other immune effector cells, and platelets.

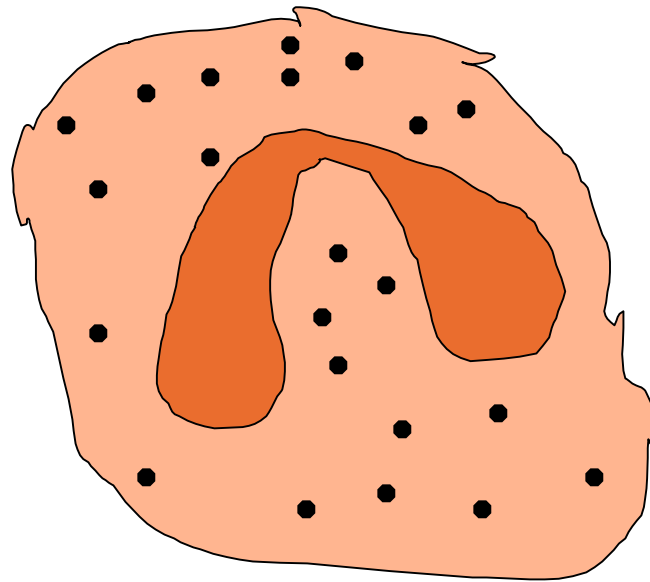


Myeloid Stem Cells... daughters of the Pluripotent Stem Cells, these are the progenitors of a host of specialized white blood cells (WBCs), red blood cells (RBCs) and the blood platelets which are crucial to blood clotting.

Eosinophil Progenitor... will produce
eosinophils

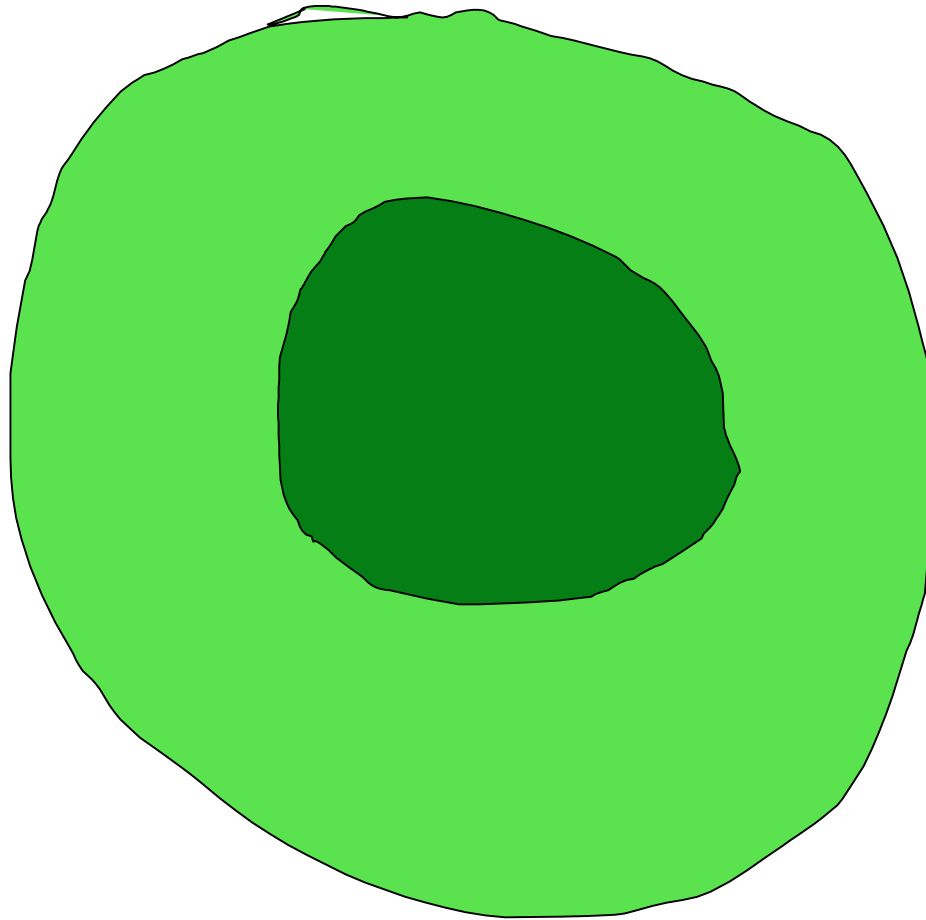


Eosinophil... these cells are active in the immune response to asthma, allergies, and parasites.



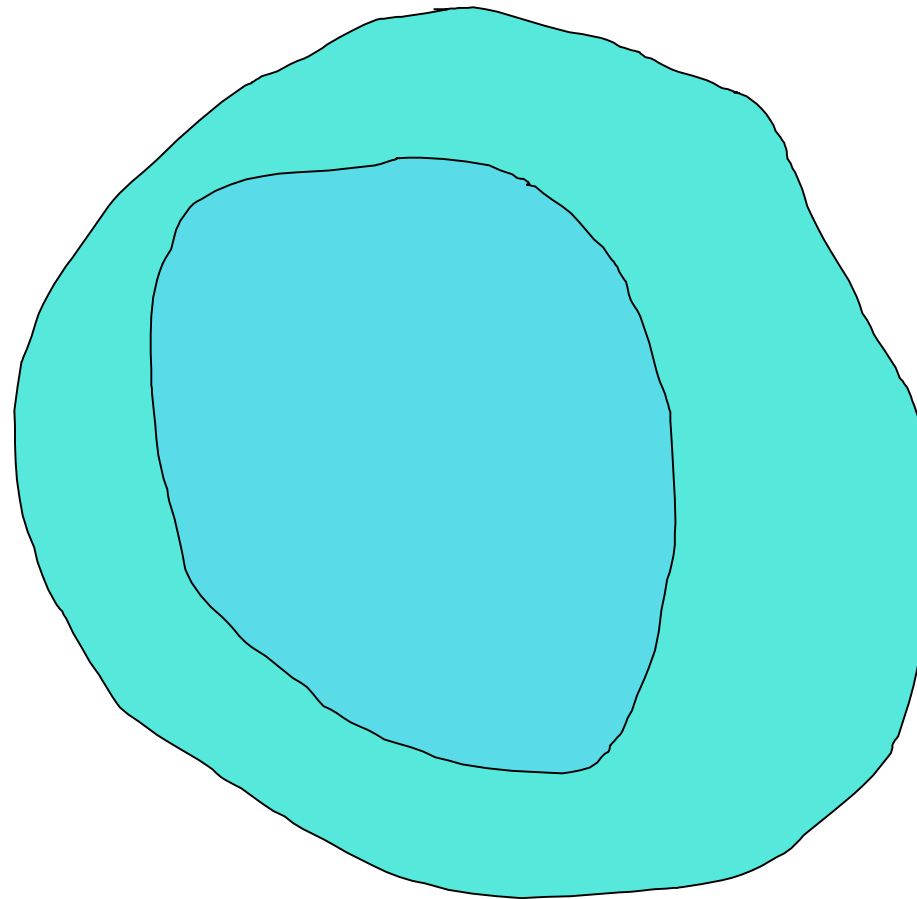
Click [HERE](#) to return to menu

Mast Cell Pathway



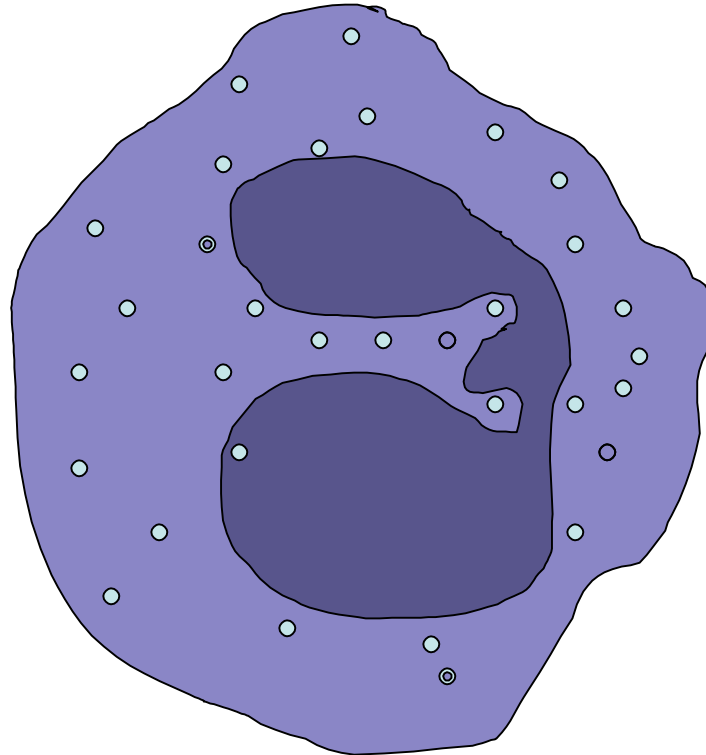
Pluripotent Stem Cell

This is the undifferentiated precursor to all of the blood cells, red and white, and other immune effector cells, and platelets.

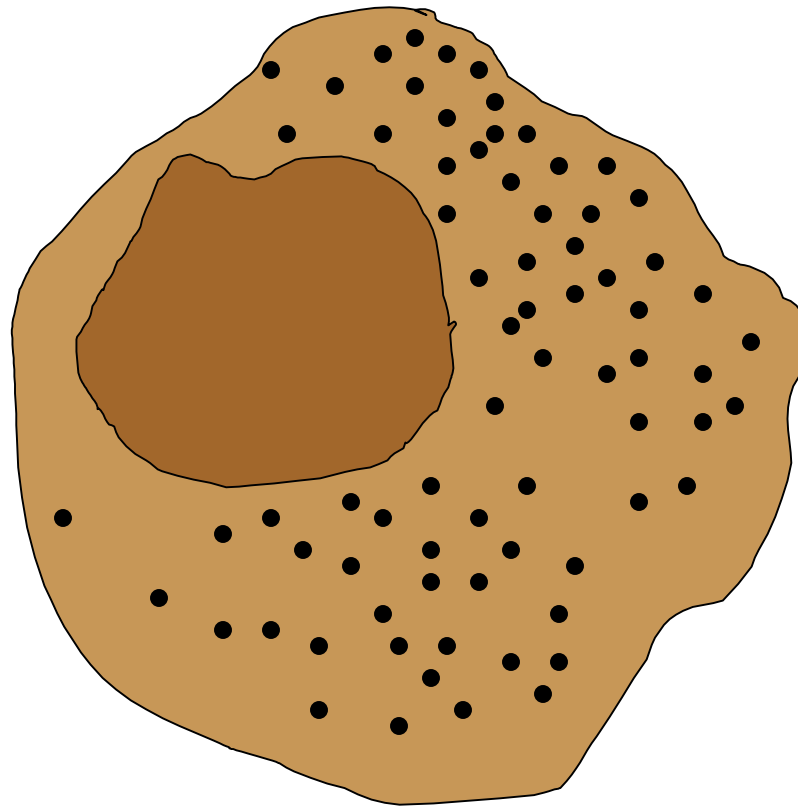


Myeloid Stem Cells... daughters of the Pluripotent Stem Cells, these are the progenitors of a host of specialized white blood cells (WBCs), red blood cells (RBCs) and the blood platelets which are crucial to blood clotting.

Basophil Progenitor... a product of the specialization of Myeloid stem cells, this cell will produce either Mast Cells or Basophils

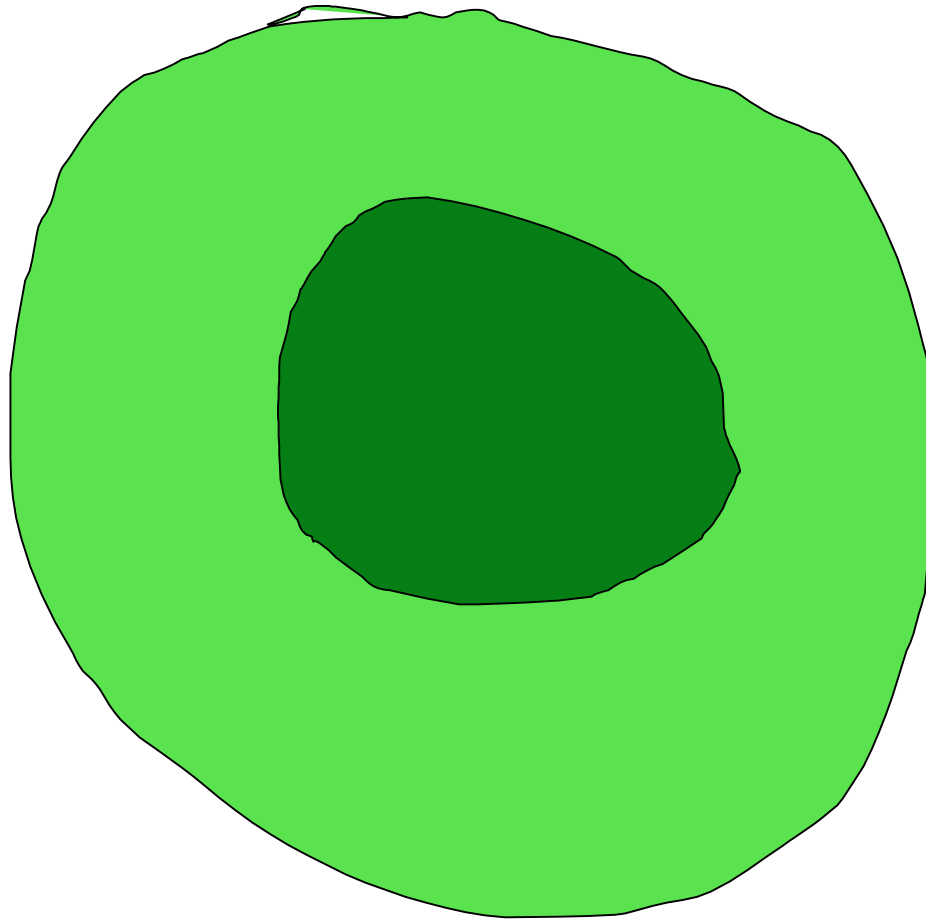


Mast Cell...like the related basophils these cells function in inflammation and allergic response. When mature, they become granulated and are found in tissues, not in peripheral blood.



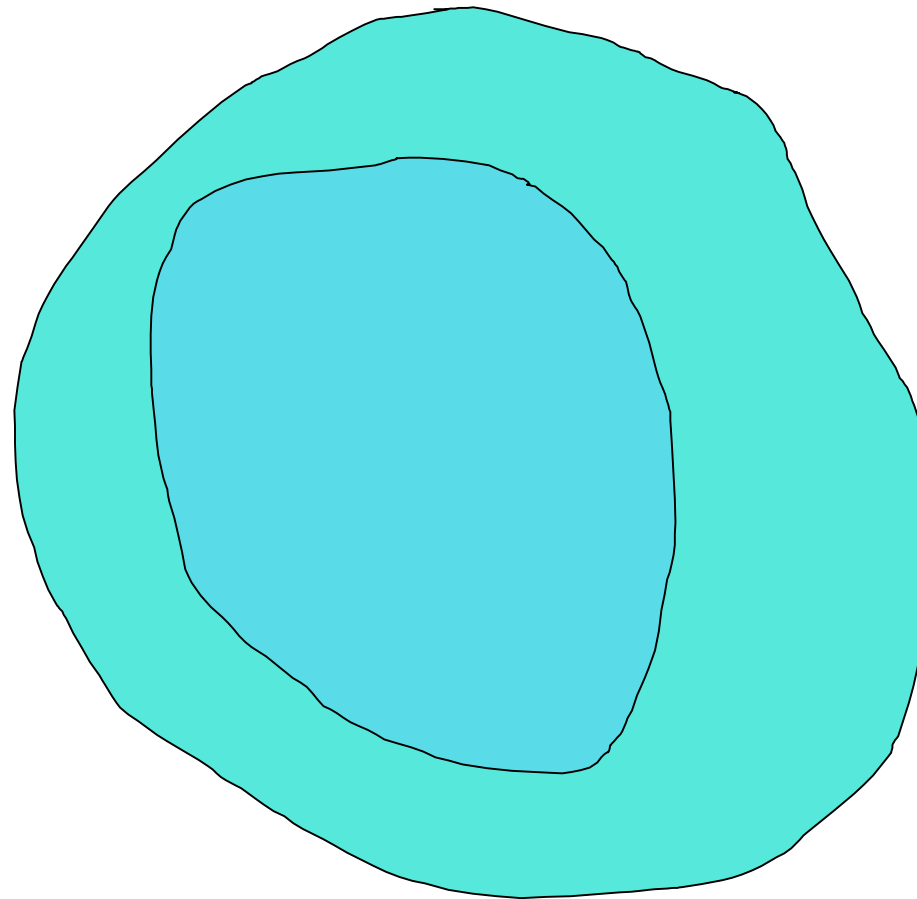
Click [HERE](#) to return to menu

Basophil pathway



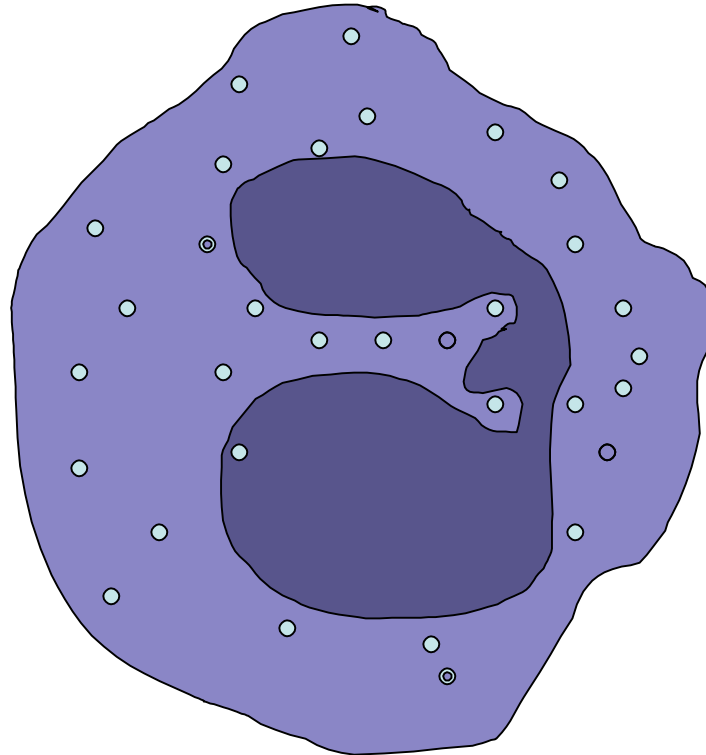
Pluripotent Stem Cell

This is the undifferentiated precursor to all of the blood cells, red and white, and other immune effector cells, and platelets.

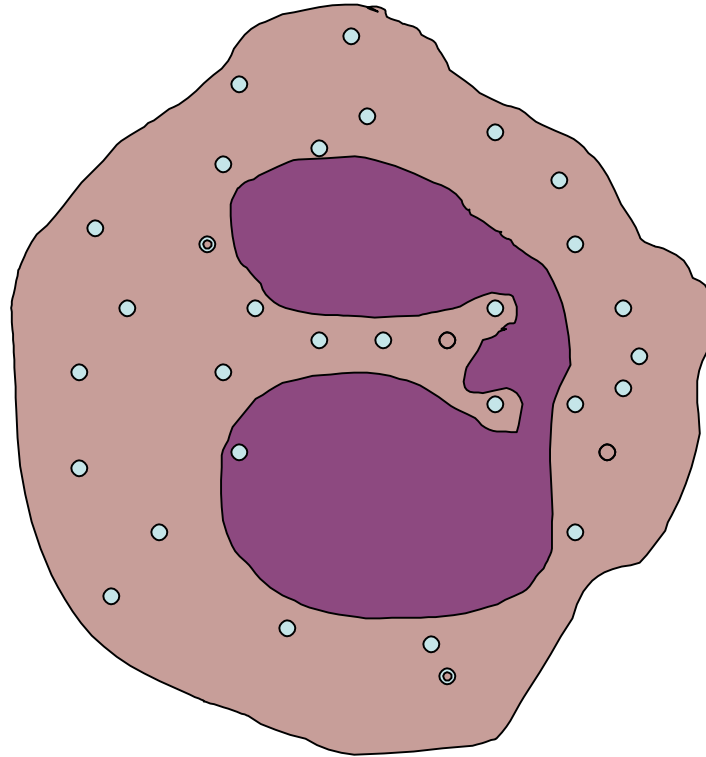


Myeloid Stem Cells... daughters of the Pluripotent Stem Cells, these are the progenitors of a host of specialized white blood cells (WBCs), red blood cells (RBCs) and the blood platelets which are crucial to blood clotting.

Basophil Progenitor... a product of the specialization of Myeloid stem cells, this cell will produce either Mast Cells or Basophils

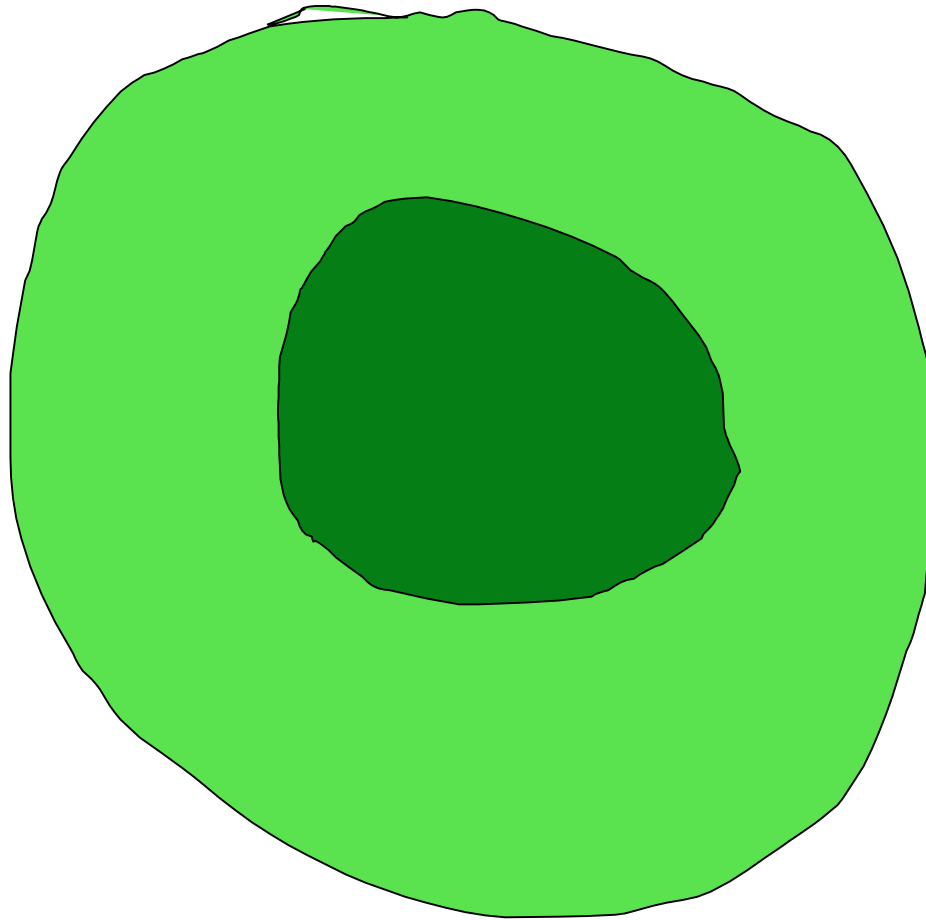


Basophil... this IgE responsive cell is characterized by cytoplasmic granules which, when released, function in destruction of parasites and also in allergic reactions. The cell releases histamine and platelet activator and other chemical signals.



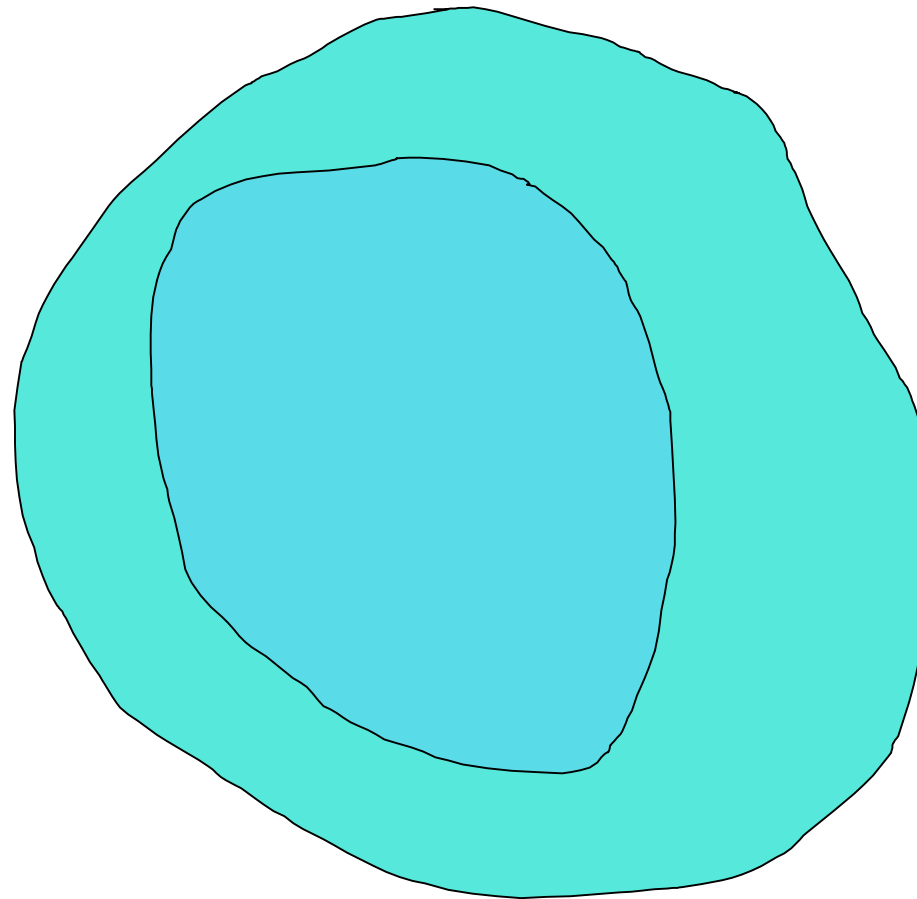
Click [HERE](#) to return to menu

Platelet pathway



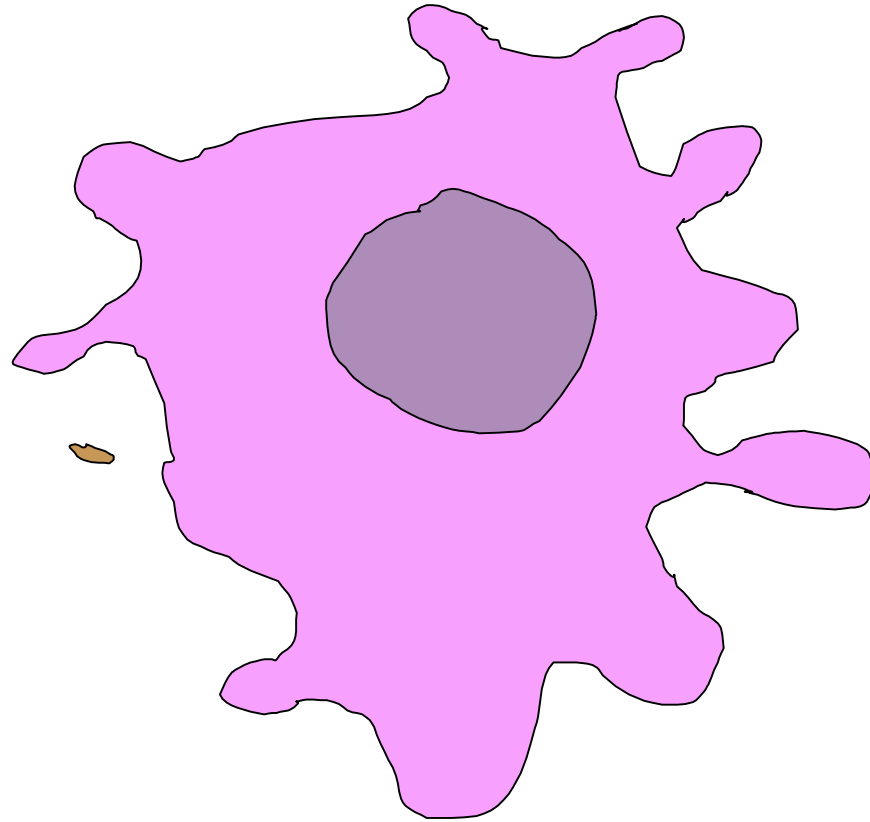
Pluripotent Stem Cell

This is the undifferentiated precursor to all of the blood cells, red and white, and other immune effector cells, and platelets.

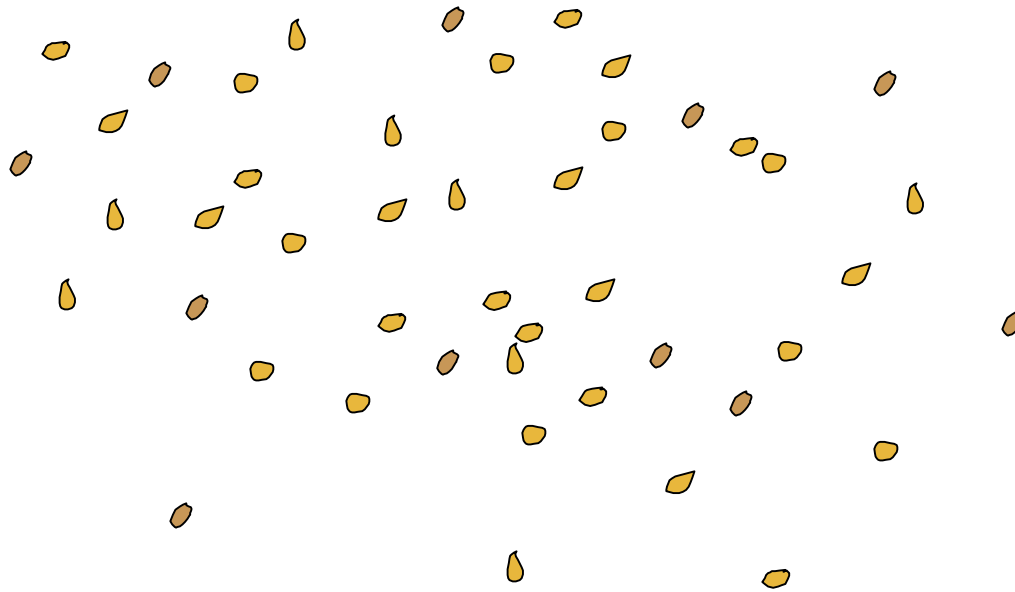


Myeloid Stem Cells... daughters of the Pluripotent Stem Cells, these are the progenitors of a host of specialized white blood cells (WBCs), red blood cells (RBCs) and the blood platelets which are crucial to blood clotting.

Megakaryocyte...fragments into
subcellular pieces called platelets

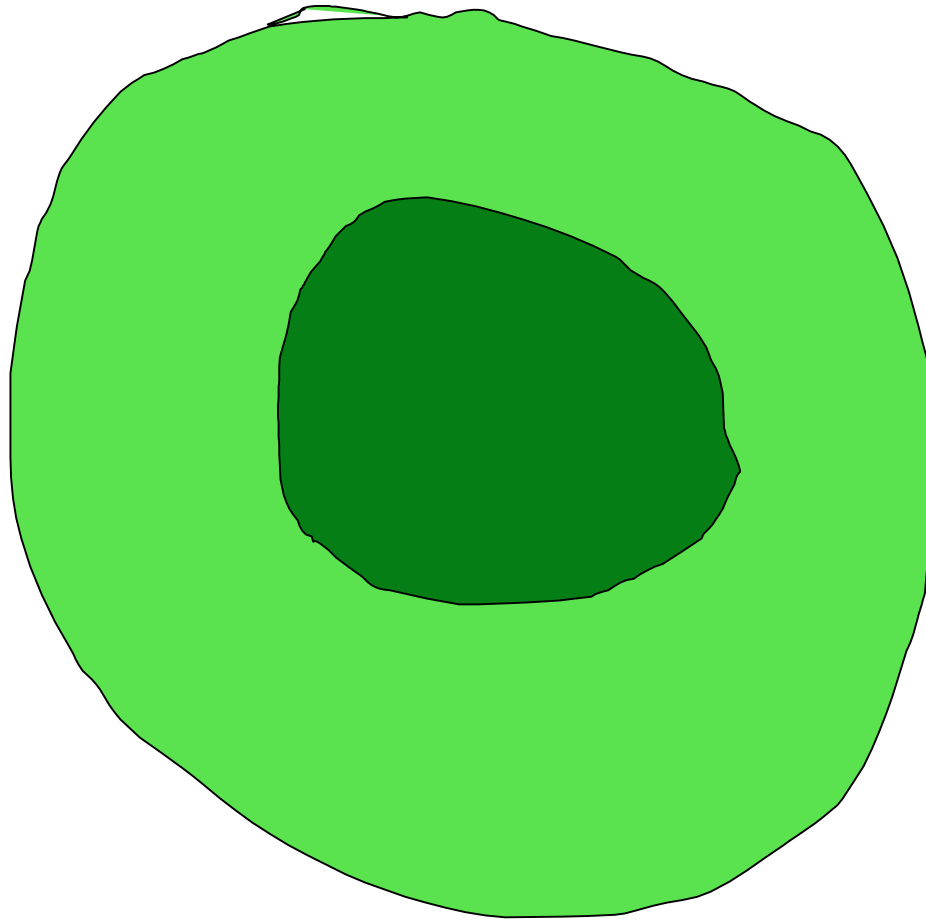


Platelets . . . are blood elements without nuclei that circulate and are involved in blood clotting and inflammation.



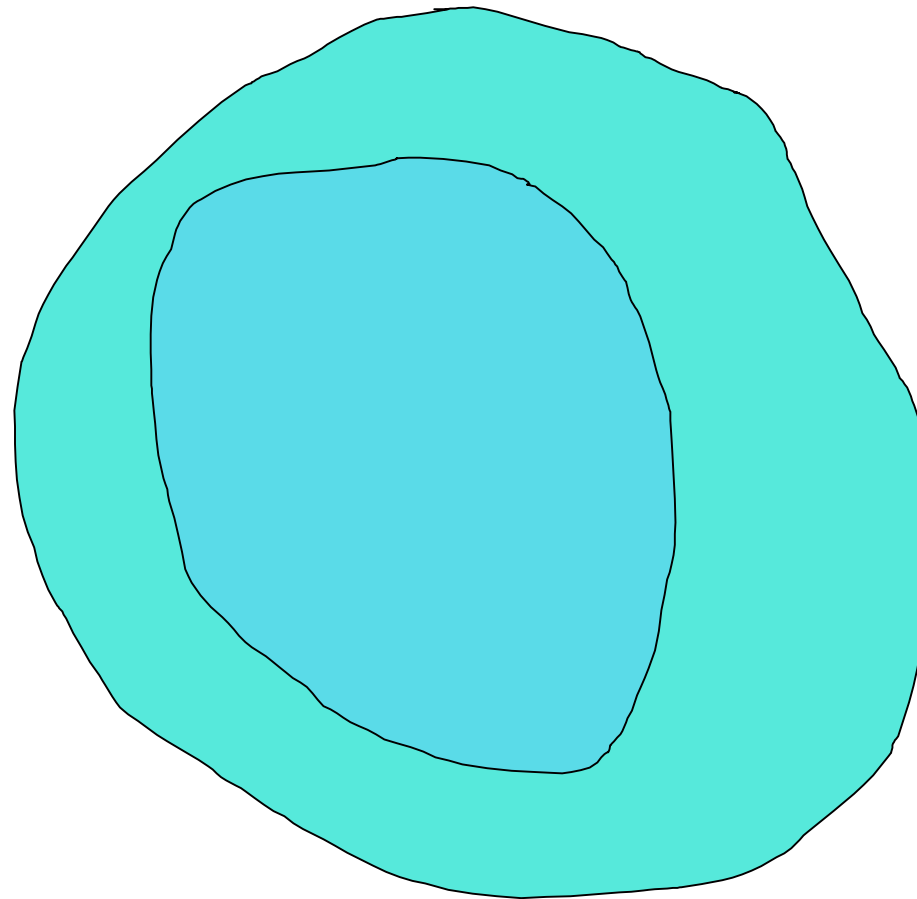
Click [HERE](#) to return to menu

Erythrocyte Pathway



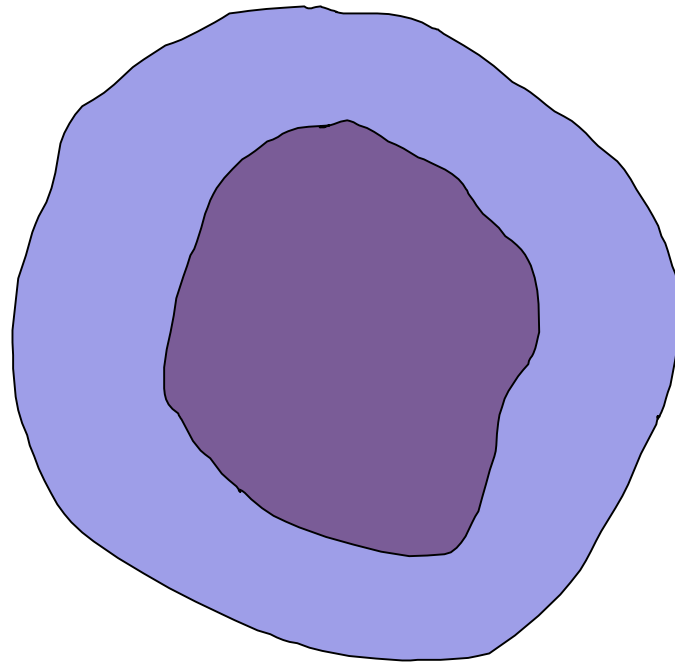
Pluripotent Stem Cell

This is the undifferentiated precursor to all of the blood cells, red and white, and other immune effector cells, and platelets.

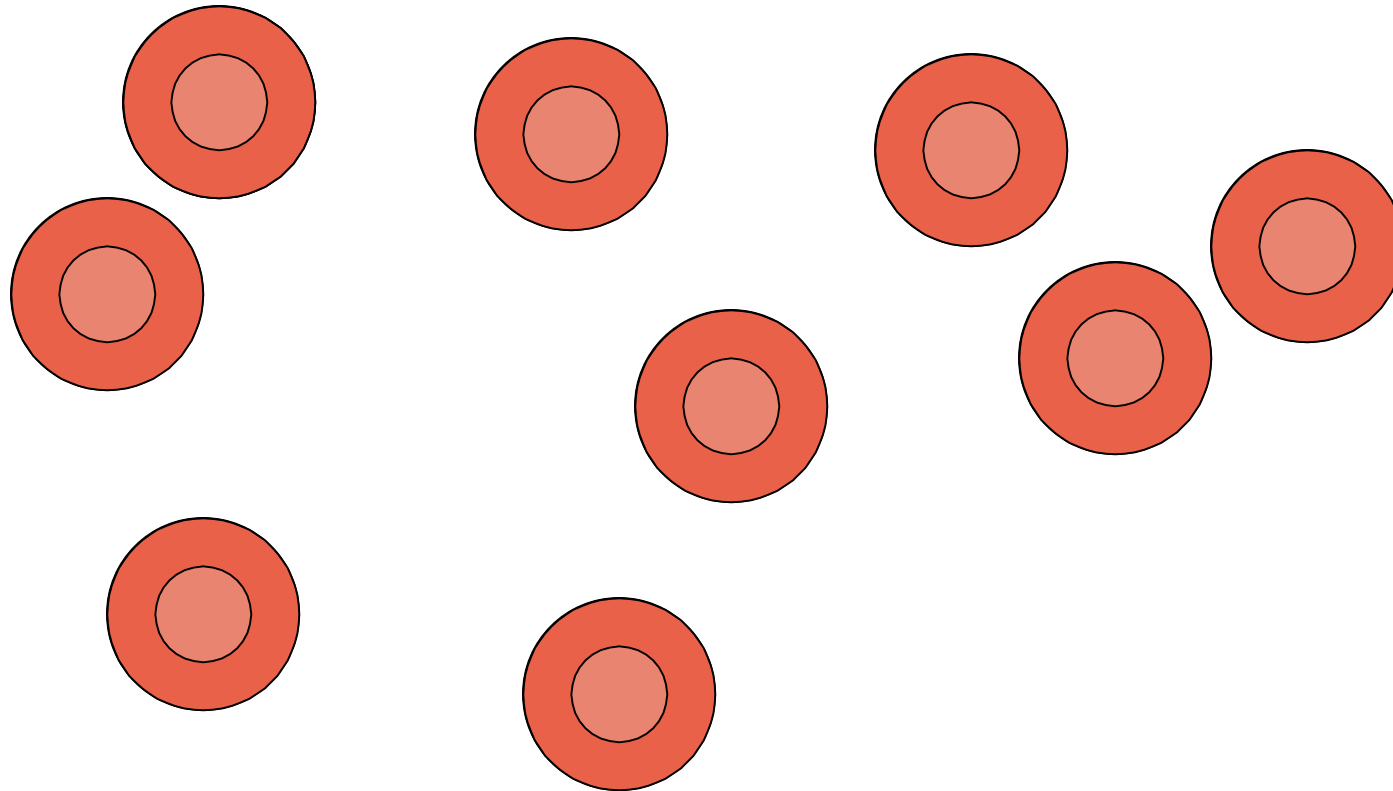


Myeloid Stem Cells... daughters of the Pluripotent Stem Cells, these are the progenitors of a host of specialized white blood cells (WBCs), red blood cells (RBCs) and the blood platelets which are crucial to blood clotting.

Erythroid Progenitor... derived from a myeloid stem cell, this is destined to produce the most common blood cell, the erythrocyte.



Erythrocytes...or red blood cells (RBCs)are enucleated cells that travel throughout the Circulatory System and carry Oxygen to all parts of the body via the abundant hemoglobin found within them.



To learn more about
Hematopoiesis click [HERE](#)

To see slides of real blood cells,
click [HERE](#)