Circulation and Blood

Circulation

A circulatory system usually consists of:

1) A _____ in which materials are _____ (_____)
2) A network of _____ or body spaces in which the fluid flows (_____)
3) A means of driving or moving the fluid (_____)

Humans (like many other vertebrates) have a _____, _____ circulatory system:

- A _____ pumps blood through a network of blood vessels that carries the blood to and from all of the _____ of the body
- Blood passes through the heart _____ in a single _____

General Functions of the Circulatory System

1) Carries _____ to all of our cells (e.g. monosaccharides, amino acids etc…)
2) Carries ____ to all of our cells
3) Carries ____ away from all of our cells
4) Carries _____ (ammonia, uric add and urea) from our cells to the _____
5) Maintains our body _____ and _____
6) _____ to heal wounds
7) Carries white blood cells and antibodies to help fight _____
8) Carries control _____ (i.e. hormones to their active sites)

Blood Components

Table 9.2
Cellular components of blood

Point of comparison	Red blood cells	White blood cells		Platelets
		Leucocytes	Lymphocytes	
Origin	red bone marrow	red bone marrow	spleen, lymph glands	red bone marrow, lungs
Cells present per mm^3 of blood (approx.)	5 500 000 (male) 4 500 000 (female)	6000	2000	250 000
Relative size	small (8 µm diameter)	largest (up to 25 µm)	large (10 µm)	smallest (2 µm)
Function	to carry oxygen and carbon dioxide to and from cells	to engulf foreign particles	to play a role in the formation of antibodies	to play a role in the clotting of blood
Life span	120 days	a few hours to a few days	unknown	7–8 days
				

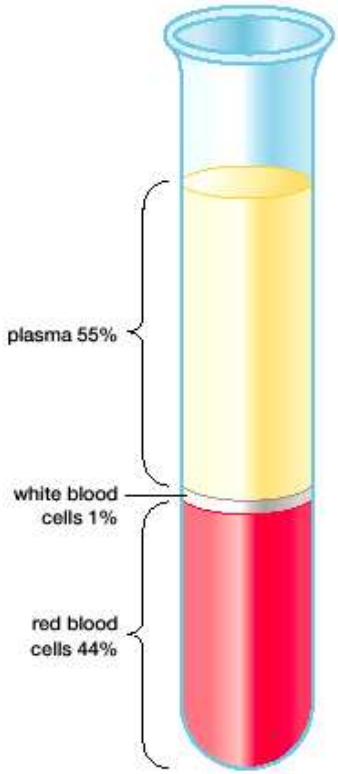


Figure 9.14 A medical device can be used to separate the three main components of the blood. When the blood is separated it settles into layers as shown here.

1) Plasma

i) Water (_____)
ii) Proteins (_____)
   a) _____ - regulates blood volume
   b) _____ - helps antibody formation and action in the blood
   c) _____ - takes part in the blood clotting process
   d) _____, _____ and _____
ii) Organic acids (____) - includes nutrients and waste products (urea)
iv) Inorganic ions (____) - act as electrolytes and regulate pH balance (e.g. Na, K, Mg, HCO_3 etc…)

2) Erythrocytes (Red Blood Cells)

- Formed in the _____
- After _____ days they are trapped in the _____ and broken down mainly by phagocytic cells

Structure:

- Do not have a _____
- _____ disc shape
- Contain _____ which has a strong chemical affinity for _____

Function:

- Carry O_2 from _____ to the body _____
- Carry CO_2 from the body _____ back to the _____

Disorders

Anemia, one of the more common blood disorders, occurs when the level of healthy red blood cells (RBCs) in the body becomes too _____. This can lead to health problems because RBCs contain hemoglobin, which carries oxygen to the body's tissues. This failure of oxygen to get to body cells can cause a variety of complications, including _____ and _____ on bodily organs.

Anemia can be caused by many things, such as:

-
-
-
-
-
-

Sickle cell anemia is a serious disease in which the body makes sickle-shaped red blood cells. "Sickle-shaped" means that the red blood cells are shaped like a "__." Normal red blood cells move easily through your blood vessels. Sickle-shaped cells don't move easily through your blood vessels. They're _____ and _____ and tend to form _____ and get stuck in the blood vessels. The clumps of sickle cells _____ _____ in the blood vessels that lead to the limbs and organs. Blocked blood vessels can cause _____, serious _____, and organ _____.

3) Leukocytes (White Blood Cells)

The 5 main types of leukocytes are formed in the _____ (granular WBC) and in _____ (non-granular WBC). They are far less numerous than red blood cells. (__ WBC: __ RBC).

Structure:

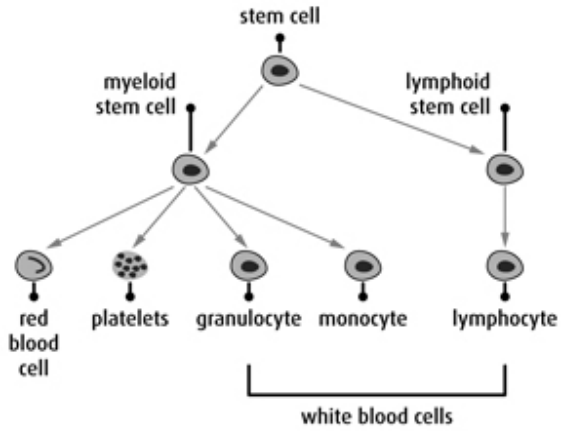
- _____ than red cells
- Contain a _____ (often with lobes)

Functions:

- Destroying _____ and _____
- Producing _____ to detoxify foreign proteins and viruses
- Produce _____ to fight infections

Disorders

Leukemia is a cancer that starts in the _____ of the _____ that make blood cells. Bone marrow is the soft, spongy material that fills the centre of most bones (where blood cells are made). Blood stem cells (immature blood cells) develop into either _____ stem cells or _____ stem cells.



Leukemia develops when the blood stem cells in the bone marrow make _____ blood cells. These abnormal cells are called leukemia cells. Over time, the leukemia cells _____ normal blood cells. This makes it hard for the white blood cells, red blood cells and platelets to do their jobs.

4) Platelets

Platelets are found in the blood system at a frequency of 250 000/mm^3 of blood.

Structure:
- Small bits of cytoplasm produced in the _____

Function:
- Involved in the _____ mechanism when blood vessels are _____

Blood Clotting

- Broken _____ causes platelets to stick to injured site
- Chemicals released from platelets react with plasma to produce _____
- Thromboplastin reacts with _____ to produce _____ (reaction aided by calcium ions)
- Thrombin reacts with _____ to produce _____
- Fibrin creates a _____ that traps blood cells
- A _____ is formed

Blood Groups, Blood Typing and Blood Transfusions

Blood types are determined by the presence of _____ (surface proteins) on the red blood cell.

Antibodies are found in blood plasma are _____ to the antigen.

A blood transfusion will work if a person who is going to receive blood has a blood group that doesn't have any _____ against the donor blood's antigens.

If antigens and antibodies of the same type come together, clumping occurs (_____). Clumping will cause _____ and _____ if an incompatible blood type is given.

Blood Group	Antigens (on red blood cells)	Antibodies (in the plasma)	Can give blood to	Can receive blood from
A				
B				
AB				
O				

Blood Type O - can be given to anyone (_____)

Blood Type AB - can receive all types (_____)

Rh Factor

Rh factor – a group of possible _____ found on red blood cells.

Rh positive – those who have the antigen; approximately _____ of the Canadian population.

Rh negative – those who DO NOT have the antigen.

Hemolytic Disease

This disease will occur if the father is ___ and the mother is ___ and the baby is ___. After the first child, the mother will develop Rh _____ against the Rh factor (following the mixing of the baby's and mother's blood at birth).

In a future pregnancy, the mother's antibodies will _____ the Rh+ cells in the baby's body. The baby's cells then _____ and it may result in a _____. This can be prevented by injection of _____ into the mother before the second pregnancy.