

Nutrients in the Blood

Blood contains other important substances, such as nutrients from food that has been processed by the digestive system. Blood also carries hormones released by the endocrine glands and carries them to the body parts that need them.

Blood is essential for good health because the body depends on a steady supply of fuel and oxygen to reach its billions of

cells. Even the heart couldn't survive without blood flowing through the vessels that bring nourishment to its muscular walls.

Blood also carries carbon dioxide and other waste materials to the lungs, kidneys, and digestive system to be removed from the body.



Did you know

"Blood cells and some of the special proteins blood contains can be replaced or supplemented by giving a person blood from someone else via a transfusion."

"In addition to receiving whole-blood transfusions, people can also receive transfusions of a particular component of blood, such as platelets, RBCs, or a clotting factor."

"When someone donates blood, the whole blood can be separated into its different parts to be used in this way."

"Doctors must make sure the blood is the right type-- A, B, AB or O -- before giving it to a patient. If a person receives the wrong type of blood, a deadly reaction can result.

"The number of people who need blood is growing faster than the number of people who donate blood."

To learn more about blood and becoming a blood donor visit the New Zealand Blood service website www.nzblood.co.nz

Information for teachers and students in schools visit:
<http://www.nzblood.co.nz/Give-blood/Resources-and-links>

Information for young patients receiving transfusions visit:
<http://www.nzblood.co.nz/Clinical-information/Transfusion-medicine/Information-for-recipients>

The UK NHS Website

http://www.giveandletlive.co.uk/en/donation/blood/virtual_session/index.html has information, games and a video showing what to expect when giving blood

**SAVE LIVES
GIVE BLOOD**



About IDFNZ - A New Zealand not for profit organisation and registered charity supporting patients affected by Primary Immune Deficiency Disorders (PID) and PID bone marrow, Liver and Bowel transplant children.

The Investigate Immunity Series of information sheets have been created for schools as a free curriculum resource promoting interest in the human immune system and how the various components function.

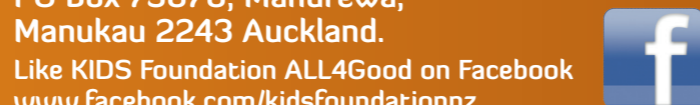
To view more information about this and to learn how IDFNZ and Kids Foundation assists sick children affected by immune disorders or requiring transplants visit our website www.idfnz.org.nz.

Schools or individuals wanting to support the work of IDFNZ / KIDS Foundation are invited to participate in our ALL4Good Schools supporting KIDS programme and competitions.

Visit www.idfnz.org.nz to view details and order a free registration pack for your school.

PO Box 75076, Manurewa,
Manukau 2243 Auckland.

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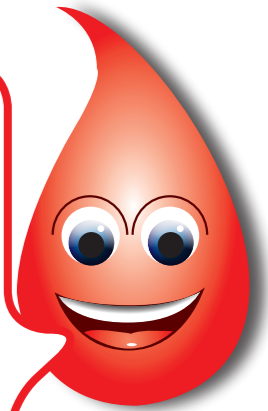


Understanding our Blood



Be a detective

Ever wondered why blood is red?
What it consists of?
Why is it so essential for life?
How it can help the body fight infection?
or repair cuts and grazes?



So What Is Blood?

Essential for life – Human Blood has two main components:

1. **Plasma:** which is mostly water; Dissolved in the plasma are nutrients, hormones and waste products.
2. **Cells and parts of cells:** that are suspended in the plasma.

These include:

- **White Blood Cells** - part of the immune system.
- **Red Blood Cells** - used to carry oxygen and carbon dioxide to and from cells of the body.
- **Platelets** - which help form clots.



Did you know

"The body of an adult male contains about five litres of blood, up to 3 litres of this is actually plasma.."



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Plasma

- Plasma is a clear, yellowish fluid.
- 90% water/ 10% dissolved substances (e.g. proteins and electrolytes).
- The protein and electrolytes in plasma are essential for life and are pumped around the body by the heart to diffuse into tissues and cells where they are needed.
- Proteins make up 6.5-8 % of material dissolved in plasma. Protein molecules are much larger than water molecules and tend to stay in blood vessels. They have more difficulty fitting through the pores in capillaries, and therefore have a higher concentration in blood vessels.
- Proteins attract water; this is one way the body maintains a constant volume of blood.
- The main proteins in plasma are albumin (60%), globulins, gamma globulins (immunoglobulin's), and clotting proteins (especially fibrinogen).

- These proteins transport substances such as lipids, hormones, medications, vitamins, and other nutrients around the body.
- These proteins are also part of the immune system (immunoglobulin's), helping blood to clot (clotting factors), maintain pH balance, and are enzymes involved in chemical reactions throughout the body.
- Electrolytes are another large category of substances dissolved in plasma. They include:
Sodium (Na+), Potassium (K+), Chloride (Cl-), Bicarbonate (HCO₃-), Calcium (Ca²⁺), Magnesium (Mg²⁺)
- Electrolytes are essential in many bodily functions including fluid balance, nerve conduction, muscle contraction (including the heart), blood clotting and pH balance.
- Other materials dissolved in plasma are carbohydrates (glucose), cholesterol, hormones and vitamins.

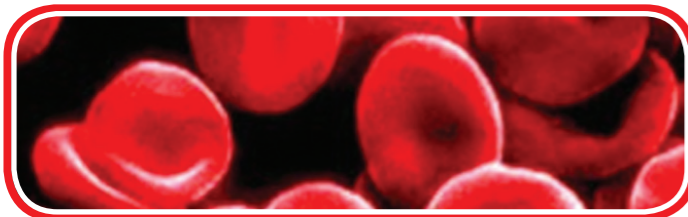


Did you know

“Blood is transported around the body in tubes known as blood vessels (veins, arteries, capillaries) – in total scientists estimate these add up to over ***96,560km** in length for an average adult; this is the equivalent of travel distance Bay of Islands to Invercargill 46 times over!

* To learn more interesting facts about blood components, heart and circulatory system there is an excellent online biology resource written by Biologist John W Kimball at:
<http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/W/Welcome.html>

Red Blood Cells (Erythrocytes)



- Red Blood Cells comprise 90% of our blood cells, giving blood its red colour.
- Made in the bone marrow, each Red Blood Cell has a life span of about 4 months
- Red Blood Cells carry oxygen around the body- this is their primary function- every cell in our body needs oxygen at all times.

- Each Red Blood Cell is shaped like a donut, concave on both sides, so it has lots of surface area to hold and release oxygen.
- Its outer membrane is very flexible so they can fit through tiny capillaries (blood vessels) without rupturing.
- The lack of nucleus gives each Red Blood Cell more room to store haemoglobin (Hb), a complex molecule that carries the oxygen .
- Haemoglobin (Hb) is made of a protein component called a globin and four pigments called hemes. The hemes use iron to bond to oxygen molecules.
- Inside each Red Blood Cell are about 280 million haemoglobin molecules.



Did you know

“The Human Heart pumps blood around the body - Typically beating 103,680 times each day (assuming 72 beats per minute).In an average life-span of 90 years the heart will have beaten 3.4 Billion times”

White Blood Cells (Leucocytes)

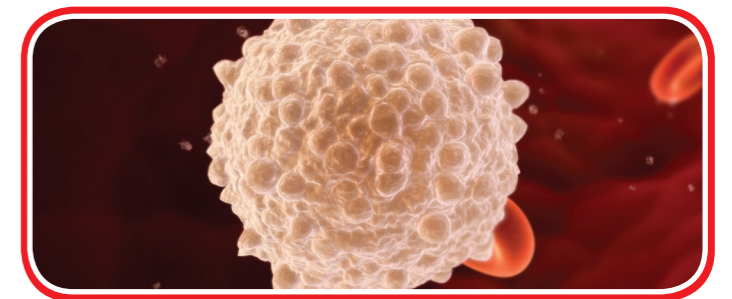
- White Blood Cells, or Leucocytes, are an important part of our immune system, helping our bodies fight infection from foreign invaders. They are like little soldiers floating around in the blood waiting to attack invaders such as viruses and bacteria.
- Most White Blood Cells are produced by the bone marrow, this occurs continuously to replace old ones as these cells only have a life-span of a few days.
- In a normal adult body there are 4,000 to 10,000 (average 7,000) White Blood Cells per microliter of blood.
- White Blood Cells circulate in the blood so that they can be transported to an area where an infection has developed; when the number of White Blood cells in your blood increases, this can be a sign of an infection somewhere in your body.
- White blood cells are actually a collection of different cells that work together as an army to destroy invading germs (bacteria and viruses). Here are some of the different types, names and classifications of white blood cells working inside your body right now:

Lymphocytes, Monocytes, Granulocytes, B-cells, Plasma cells, T-cells, Helper T-cells, Killer T-cells, Suppressor T-cells, Natural killer



Did you know

“Some people are born with immune systems that do not work properly. To learn more about genetic faults in the immune system causing medical conditions known as Primary Immune Deficiency disorders (PID's) visit the IDFNZ website www.idfnz.org.nz for more information and printed resources.”



cells, Neutrophils, Eosinophils, Basophils, Phagocytes, Macrophages

To learn more about the immune function of these white blood cells:

Read IDFNZ Investigate Immunity – Our Immune System.

See videos of these white blood cells in action, visit some of the following websites:

<http://science.howstuffworks.com/environmental/life/human-biology/immune-system5.htm#>

<http://www.nobelprize.org/educational/medicine/immunity/>

http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway/ourselves/2_keeping_healthy3.shtml

Platelets

- Platelets (thrombocytes) are tiny oval-shaped cells made in the bone marrow. They help in the clotting process.
- When a blood vessel breaks, platelets gather in the area and help seal off the leak.
- Platelets survive only about 9 days in the bloodstream and are constantly being replaced by new cells.
- Important proteins called Clotting Factors are critical to the clotting process. Although platelets alone can plug small blood vessel leaks and temporarily stop or slow bleeding,

the action of clotting factors is needed to produce a strong, stable clot.

- Platelets and Clotting Factors work together to form solid lumps to seal leaks, wounds, cuts, and scratches and to prevent bleeding inside and on the surfaces of our bodies. The process of clotting is like a puzzle with interlocking parts. When the last part is in place, the clot happens – but if even one piece is missing, the final pieces can't come together.



Did you know

“The level of platelets in our blood is very important - too low and excessive bleeding can occur . However, if the number of platelets is too high, blood clots can form”