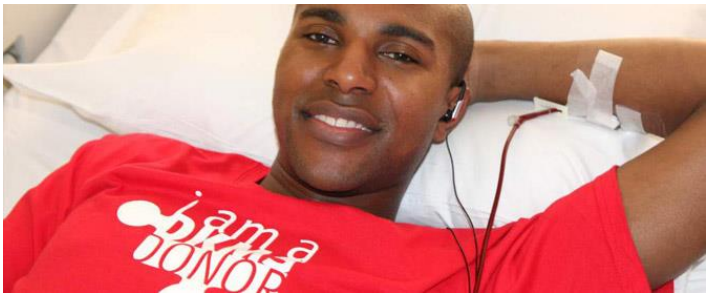
# Cancer Association of South Africa (CANSA)

Research • Educate • Support

## Fact Sheet on Utilising Blood Products for Cancer Patients

**Introduction**

Blood or blood products cannot be made in a laboratory, so the blood or blood cells used in transfusions to help people with cancer must come from a donor.




[Picture Credit: Blood Donor]

South Africa could be missing out on thousands of blood donations because people mistakenly believe that blood and blood products are used mainly in emergency situations. A survey conducted by the Australian Red Cross Blood Service shows that two out of every five Australians who do not donate blood believe that road trauma is the leading cause of a person needing donated blood.

If this is the case in South Africa, this mistaken belief might be preventing thousands of South Africans from giving blood. Are you one of them?

Eight out of every ten South Africans will need a blood transfusion sometime in their lifetime.

Collection and distribution of blood products within South Africa is the responsibility of the South African National Blood Service, (SANBS), is a non-profit organisation that provides human blood for transfusion that operates in South Africa, with the exception of the Western Cape. The Western Cape has a separate blood centre, the Western Province Blood Transfusion Service.
(Cancer.Net; Australian Red Cross Blood Service; LifeStream; Health24; Wikipedia).

**One Blood Donation Can Save Several Lives**

One unit of blood can be separated into three primary components which can help several people in need:

- Red Blood Cells - carry oxygen to the body's organs and tissues. These cells are needed for accident victims and surgery patients. They can be refrigerated and stored for only up to 42 days.
- Plasma - is 90 percent water, makes up to 55 percent of blood volume and is needed for organ, burn and shock patients. Plasma can be frozen and stored up to one year.
- Platelets - are an essential factor in blood clotting and give patients with leukaemia and other cancers a chance to live. These can be stored at room temperature no longer than 5 days.

All three of the above are important blood components that make up a unit of blood that are manufactured in the body's bone marrow.
(LifeStream).

**Recipients of Blood and Blood Products in South Africa**

Eight out of every ten people in South Africa will need donated blood (or blood products) at some time in their lives. Without blood donated by other people, many of them would have died. Still, many people do not give the blood transfusion service a second thought until they are the ones needing blood.

In South Africa blood gets used for different medical procedures. These are as follows:

- 28 percent for patients with chronic diseases that are not surgically treated and for cancer patients, e.g. blood cancers, such as leukaemia and bone marrow cancer
- 26 percent for women who haemorrhage during or after childbirth and for premature babies
- 26 percent for patients undergoing surgery such as hip and knee replacements, heart surgery and gastrointestinal surgery. Many operations would be impossible without donated blood.
- 10 percent for sick children
- 6 percent for research and
- 4 percent for people injured in accidents

(Health24; South African National Blood Service).

**Why People with Cancer Might Need Blood or Blood Products**

People with cancer might need blood transfusions because of the cancer itself. For example:

- Some cancers (especially digestive system cancers) cause internal bleeding, which can lead to anaemia from too few red blood cells.
- Blood cells are made in the bone marrow, the spongy centre of certain bones. Cancers that start in the bone marrow (such as leukaemias) or cancers that spread there from other places may crowd out normal blood-making cells, leading to low blood counts.
- People who have had cancer for some time may develop something called *anaemia of chronic disease*. This anaemia results from certain long-term medical conditions that affect the production and lifespan of red blood cells.
- Cancer can also lower blood counts by affecting organs such as the kidneys and spleen, which help keep enough cells in the blood.

[Picture Credit: Donating Blood]

Cancer treatments may also lead to the need for blood transfusions:

- Surgery to treat cancer may lead to blood loss and a need for red blood cell or platelet transfusions.
- Most chemotherapy drugs affect cells in the bone marrow. This commonly leads to low blood cell counts, and can sometimes put a person at risk for life-threatening infections or bleeding.
- When radiation is used to treat a large area of the bones, it can affect the bone marrow and lead to low blood cell counts.
- Bone marrow transplant (BMT) or peripheral blood stem cell transplant (PBSCT) patients get large doses of chemotherapy and/or radiation therapy. This destroys the blood-making cells in the bone marrow. These patients often have very low blood cell counts after the procedure and need transfusions.

(American Cancer Society; Mayo Clinic).

**Blood and Blood Products**

The following is a list of blood and blood products that are used:

Whole blood - in most circumstances, blood component therapy has replaced the use of whole blood. However, whole blood is still occasionally used for massive transfusion in circumstances in which rapid correction of acidosis, hypothermia and coagulopathy is required. This mainly occurs in military situations for trauma patients who require resuscitation.

Red blood cells - RBCs are prepared from whole blood by removal of most of the plasma. They are indicated in both acute haemorrhage and chronic anaemia. Red cell units have a haematocrit of 70% (citrate phosphate dextrose adenine (COPD-1) solution) or 55-60% (additive solutions (AS)) with a shelf life of 35 days and 42 days respectively when refrigerated at 1-6°C. A decision to give a transfusion should be reached both on the patient's clinical situation and laboratory findings, not on Hb alone. Transfusion is often not considered until Hb <7 g/dL but patients with unstable angina or acute myocardial infarction (MI) may require transfusion at Hb <10 g/dL. A single unit of red blood will typically increase Hb by 1g/dL. Other RBC products include leukocyte-reduced components, which can reduce febrile reactions and are an alternative to cytomegalovirus (CMV)-seronegative components and prevent HLA alloimmunisation. Also, washed components (RBC and platelets) remove harmful plasma antibodies.

Cancer treatments can reduce the number of red blood cells in the blood. This is called anaemia. Sometimes cancer can also cause anaemia.

Anaemia can cause feelings of fatigue and breathlessness. This is because without enough red blood cells, the body doesn't have enough haemoglobin. Haemoglobin is a substance that carries oxygen through the body.

Cancer patients often receive transfusions when their hemoglobin concentration falls to dangerously low levels due to chemotherapy or due to the disease itself. The availability of

recombinant human erythropoietin (rHuEPO) has significantly reduced transfusion frequencies in cancer patients.

Platelets - each unit of platelets is prepared from a single whole blood collection by differential centrifugation and contains at least 5.5 x $10^{10}$ platelets in 50 ml of plasma. They are stored at 20-24°C in plastic containers under agitation and have a shelf life of five days. Each unit can raise platelet count by 5-10 x $10^{9}$/L. Alternatively, platelets are prepared by apheresis (a process of filtration), contain >3 x $10^{11}$ platelets suspended in 200 ml plasma, and are equivalent to six random donor platelet units. Platelets are not usually cross-matched with the recipient, but ABO type-specific platelets should be provided where possible as, otherwise, the increment is 10-20% less in platelet count.

Platelets are given to patients with thrombocytopenia who are bleeding or those with severe thrombocytopenia, as a precaution. Patients rarely bleed spontaneously when platelet count is >20 x $10^{9}$/L and patients receiving chemotherapy can often tolerate counts of 5-10 x $10^{9}$/L.

Platelets are tiny cells in the blood which form clots to help stop bleeding. Cancer and some cancer treatments can affect the bone marrow where platelets are made. When this happens, the number of platelets in the blood becomes lower. This can increase the risk of bleeding and cause nosebleeds, bruising, heavier periods, bleeding gums or more serious problems.


[Picture Credit: Platelet Concentrate]

If the number of platelets is too low, doctors may recommend a platelet transfusion. The platelets are run through a drip and into the recipient's bloodstream. The transfusion usually takes 15-30 minutes and can usually be done at an outpatient clinic.

Granulocytes - these are mainly given to neturopenic cancer patients developing bacterial sepsis unresponsive to conventional antibiotic therapy for at least 24-48 hours. Preparations collected from normal donors by apheresis contain at least 1 x $10^{10}$ neutrophils/unit, but the concentration can be increased by using donors stimulated by steroids and/or growth factors. Granulocyte preparations can only be stored for 24 hours at 20-24°C. They need to be cross-matched with the recipient's serum because of the large number of red cells they contain and need to be irradiated because of the large number of lymphocytes present.

Granulocytes are only usually considered for patients with an absolute neutrophil count <0.5 x $10^{9}$/L and a good chance of marrow recovery. They usually need to be given daily until patients can maintain an absolute neutrophil count >0.5 x $10^{9}$/L without transfusion or until the infection has resolved. Patients frequently have a febrile reaction to granulocytes and these are more severe when amphotericin is infused at around the time of the granulocyte infusion.

Fresh frozen plasma (FFP) - FFP is produced by centrifugation of one donation of whole blood, and collecting the supernatant liquid. The plasma is frozen within eight hours of collection, in order to maintain the activity of factor V and factor VII. The main indication for FFP is deficiency of multiple coagulation factors found in liver disease and disseminated intravascular coagulation (DIC) and forms part of massive transfusion protocols in major

trauma or in major obstetric, gastrointestinal tract or surgical haemorrhage. It is also often used for urgent reversal of warfarin anticoagulation. Because of the large volume that would be required, FFP is not generally used to replace individual clotting factors. In these situations specific factors are given.

Cryoprecipitate is made by thawing FFP at 1-6°C and is generally used for patients with von Willebrand's disease or severe hypofibrinaemia.

Plasma-transfused patients need to be observed for circulatory overload and the main side-effects include fever, chills, bronchospasm, and adult respiratory distress syndrome.

Albumin - this is available as 5% or 25% solution for the treatment of hypovolaemia and hypoalbuminaemia . The cost-benefit of albumin in the treatment of hypovolaemia is controversial but it is still used in the management of liver disease and ascites.[7] It is tested for hepatitis C virus (HCV) RNA and virally inactivated, and not considered as a risk factor for viral transmission. Its use has now largely been superseded by non-plasma colloidal solutions.

Immunoglobulin - intravenous (IV) immunoglobulin is used in the treatment of immuno-thrombocytopenia, Guillain-Barré syndrome and autoimmune haemolytic anaemias. RhD immunoglobulin is used to prevent exposure to D-positive red cells causing Rh sensitisation in D-negative patients. This is usually given in pregnancy and immediately after birth to prevent haemolytic disease of the newborn in future babies.


[Picture Credit: Immunoglobulin]

Antithrombin III concentrate - this is prepared from human plasma and used to treat congenital deficiency of antithrombin III and side-effects include flushing, nausea, headache, and, rarely, fever andallergic reactions.

Factor VIIa (recombinant) - this is used in patients with inhibitors to factors VIII and IX and is indicated in patients with haemophilia A and B. Theoretical concerns about an increased risk of deep vein thrombosis and pulmonary embolus have not been borne out in randomised trials.

Factor VIII fraction, dried - also known as human antihaemophilic fraction, this is prepared from human plasma by a suitable fractionation technique and indicated for the treatment and prophylaxis of haemorrhage in haemophilia A. Large or frequently repeated doses in patients with blood groups A, B or AB can lead to intravascular haemolysis, this is less likely to occur with high-potency purified concentrates. Side-effects include allergic reactions, chills and fever.

Factor VIII inhibitor bypassing fractions - this is prepared from human plasma and is indicated for the control of spontaneous bleeding episodes or to cover surgical interventions in haemophilia A and haemophilia B patients with inhibitors.[9] It has also been used in non-

haemophiliac patients with acquired inhibitors to factors VIII, XI and XII.[10] Intravascular coagulation is the main adverse effect.

Dried factor IX fraction - this is prepared from fractionating human plasma, and may also contain factors II, VII, and X. It is used for the treatment of haemophilia B (congenital factor IX deficiency) or acquired haemophilia. The risk of thrombosis has largely been obviated by increasing the purity of the product. Side-effects include allergic reactions, chills and fever, but these are usually infrequent and mild.

Factor XIII dried - this is also known as human fibrin-stabilising factor, and is indicated for congenital factor XIII deficiency. Adverse effects, which include allergic reactions and fever, are rare. Recombinant factor XIII has been shown to be a safe and effective alternative in trials.

Protein C concentrate- -this is prepared from human plasma. It is indicated in congenital protein C deficiency, a congenital disorder characterised by an increased tendency to coagulation.
(Patient.co.uk; Leukemia & Lymphoma Society; Blood.co.uk; Memorial Sloan Kettering Cancer Center; The Oncologist; Macmillan Cancer Support; Blood Journal; Nicholson, Wolmarans & Park, 2000; Transfusion Guidelines).

**The South African National Blood Service has Lifted a Ban on Gay Men Donating Blood**

In the past, gay men were seen as being at high risk of being infected with HIV and could only donate blood to SANBS if they had been celibate for six months or longer, says Mamba Online.


[Picture Credit: Gay Men]

The policy made in 2006 was widely criticised as discriminatory, unfairly targeting gay men while allowing heterosexual people who engaged in equally risky or casual sex to donate blood.

Vanessa Raju, SANBS Communications Manager, confirmed to Mamba Online that the non-discriminatory policy had been put in place that favours people in monogamous relationships, regardless of sexuality.

She said that anyone who has a new sexual partner will not be allowed to donate blood for six months, and that anyone who has multiple partners will not be allowed to donate blood. Both criteria are irrespective of a person's sexual orientation.

South Africa has one of the highest rates of HIV in the world, and according to the report, the epidemic in is a primarily heterosexual one.
(Daily Mail).

**Red Cells Stored Longer than Five Weeks May be Harmful**

Clinical practice guidelines recently released, states that transfusion of fresh red blood cells (RBCs) compared to standard issue RBCs have similar clinical outcomes, but also stated there are questions about the last week of storage. RBCs may be stored up to 6 weeks (42 days).

Researchers transfused 60 healthy adult volunteers with one unit of autologous, leukoreduced, packed RBCs stored 1, 2, 3, 4, 5 or 6 weeks (n=10 per group). Transfusion of RBCs stored for progressively longer times were associated with increased extravascular haemolysis, decreased cell recovery, and increased hepcidin levels. Circulating nontransferrin-bound iron was observed in 10% (1/10) and 78% (7/9) of volunteers transfused with RBCs stored for 5 or 6 weeks, respectively (p=0.003), which may cause patients to be more susceptible to pathogenic infections or other adverse events.

The researchers concluded that maximum storage time of RBCs should continue to be evaluated in terms of safety, cost and supply.
(Transfusion News).

**Medical Disclaimer**

This Fact Sheet is intended to provide general information only and, as such, should not be considered as a substitute for advice, medically or otherwise, covering any specific situation. Users should seek appropriate advice before taking or refraining from taking any action in reliance on any information contained in this Fact Sheet. So far as permissible by law, the Cancer Association of South Africa (CANSA) does not accept any liability to any person (or his/her dependants/estate/heirs) relating to the use of any information contained in this Fact Sheet.

Whilst CANSA has taken every precaution in compiling this Fact Sheet, neither it, nor any contributor(s) to this Fact Sheet can be held responsible for any action (or the lack thereof) taken by any person or organisation wherever they shall be based, as a result, direct or otherwise, of information contained in, or accessed through, this Fact Sheet.

**Sources and References**


**American Cancer Society**
http://www.cancer.org/treatment/treatmentsandsideeffects/treatmenttypes/bloodproductdonationandtransfusion/blood-transfusion-and-donation-why-cancer-patients-may-need-transfusions

**Australian Red Cross Blood Service**
http://www.donateblood.com.au/category/news-tags/cancer-patients

**Blood Donor**
http://www.power-of-us.org/delete-blood-cancer-dkms

**Blood.co.uk**
http://www.blood.co.uk/about-blood/how-blood-is-used/

**Blood Journal**
http://www.bloodjournal.org/content/99/1/390?sso-checked=true

**Cancer.Net**
http://www.cancer.net/navigating-cancer-care/diagnosing-cancer/tests-and-procedures/donating-blood-and-platelets

**Daily Mail**
http://www.dailymail.co.uk/news/article-2306180/Africa-s-traditional-gay-wedding-Men-make-history-marry-tribal-costume--say-t-wait-parents.html

**Donating Blood**
https://ca.news.yahoo.com/blogs/dailybrew/south-africa-ends-ban-homosexual-blood-donations-no-205228910.html

**Gay Men**
http://www.dailymail.co.uk/news/article-2306180/Africa-s-traditional-gay-wedding-Men-make-history-marry-tribal-costume--say-t-wait-parents.html

**Health24**
http://www.health24.com/Lifestyle/Your-Blood/Blood-donation-Client-20120721

**Immunoglobulin**
http://images.frompo.com/i/normal-immunoglobulin

**Leukemia & Lymphoma Society**
http://www.lls.org/diseaseinformation/managingyourcancer/newlydiagnosed/understandingdiagnosis/bloodtransfusion/

**LifeStream**
https://www.lstream.org/BloodDonationFacts.aspx

**MacMillan Cancer Support**
http://www.macmillan.org.uk/information-and-support/treating/supportive-and-other-treatments/supportive-therapies/blood-transfusions.html?utm_source=PDF&utm_medium=download

http://www.macmillan.org.uk/information-and-support/treating/supportive-and-other-treatments/supportive-therapies/platelet-transfusions.html

**Mayo Clinic**
http://www.mayoclinic.org/tests-procedures/blood-transfusion/basics/why-its-done/prc-20021256

**Memorial Sloan Kettering Cancer Center**
http://www.mskcc.org/about/blood/platelet-donations

**Nicholson, J.P., Wolmarans, M.R. & Park, G.R.** 2000. The role ofr albumin in critical illness. British Journal of Anaesthesia, 85(4):599-610.

**Patient.co.uk**
http://www.patient.co.uk/doctor/Blood-Transfusion-and-Blood-Products.htm

**Platelet Concentrate**
http://blog.seattlepi.com/accesforpethealth/2009/06/16/how-veterinary-patients-might-help-human-patients-a-platelet-clinical-trial/

**South African National Blood Service**
http://www.atkvresorts.co.za/news/south-african-national-blood-service

**The Oncologist**
http://theoncologist.alphamedpress.org/content/10/1/63.full

**Transfusion Guidelines**
http://www.transfusionguidelines.org.uk/transfusion-handbook/8-effective-transfusion-in-medical-patients/8-8-indications-for-intravenous-immunoglobulin-ivig

**Transfusion News**
http://transfusionnews.com/2016/12/21/red-cells-stored-longer-than-five-weeks-may-be-harmful/

**Wikipedia**
https://en.wikipedia.org/wiki/South_African_National_Blood_Service