



Information for Patients about Blood Transfusion and Tissue Transplantation

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Table of Contents

What is blood?.....	4
What is given during a blood transfusion?.....	5
Where does the blood component or plasma protein product come from?	5
When would I receive a blood component transfusion?	5
What are plasma protein products?.....	6
How long does it take to receive a blood transfusion?	6
What happens if I need a blood transfusion or a blood product?	7
What are the risks of receiving a plasma protein product?	7
What are the risks of being transfused a blood component?.....	8
Patient Risk Charts.....	9
Are there any alternatives to having a blood transfusion?.....	11
Can I refuse a blood transfusion?.....	11
Does artificial blood exist?	11
Can I donate my own blood?.....	12
Can I donate directly for a family member or friend?.....	12
How will I know if I received a transfusion?	12
Contacts for more information about blood transfusion:.....	13
References	13
Tissue Transplantation	14
What is a tissue graft?	14
Where does tissue come from?.....	14
When would I receive a tissue graft?	14
What are the risks?.....	14
How will I know I received a tissue graft?	14
How can I become a tissue donor?	15
Contact information for tissue and bone:	15
Notes or Questions to Ask.....	15

Blood Transfusion

Blood transfusions are an important part of healthcare. In 2015 in Saskatchewan, more than 29,800 units of red blood cells, and a total of 10,600 units of platelets and plasma were given to people who needed them! Receiving blood in Canada is very safe and there is little risk of transfusion associated complications. While most people who are hospitalized won't need a blood transfusion, your doctor or nurse practitioner may recommend that you receive a transfusion, if there is a medical need. It is important for you to be informed about blood transfusion.

This booklet will explain:

- What a **blood transfusion** is.
- The **benefits** and **risks** associated with blood transfusions.
- Possible **alternatives** to having a blood transfusion.

If your doctor or nurse practitioner recommends a blood transfusion as part of your medical treatment, you (or a substitute decision maker, in the event that you cannot speak for yourself) will be asked to give consent. It is very important that you understand what you are agreeing to. If you have any questions, concerns, or need clarification about information found in this booklet, ask your doctor or nurse practitioner.

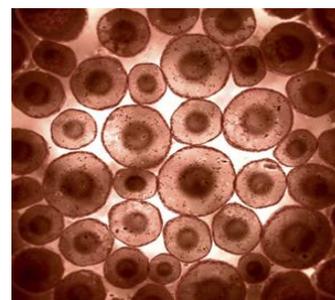
What is blood?

Although it seems to be a simple liquid, blood has a complex composition! Blood is made of both a fluid portion, and a cellular portion. The fluid portion is called plasma. There are three types of cells that float within the plasma, all of which are produced by the bone marrow:

1. **Red Blood Cells** – These cells are red and give blood its characteristic color. Red blood cells carry oxygen from the lungs to all the other parts of the body.
2. **White Blood Cells** – These cells are important in fighting infections. There are several types of white blood cells.
3. **Platelets** – These are the smallest of the blood cells. When injuries occur to the blood vessels, platelets act to “plug the hole” in the blood vessel and stop the bleeding.

The **plasma** also contains proteins. The most important types of proteins include:

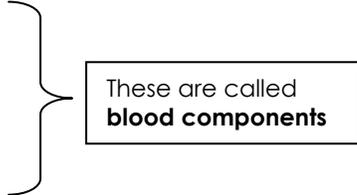
1. **Albumin** – the most common type of protein in the plasma. It is made by the liver. It carries nutrients and hormones around the body.
2. **Immunoglobulins** (also known as antibodies) – proteins that are produced by specific white blood cells of the bone marrow. They ‘tag’ invading bacteria and viruses to help white blood cells ‘see’ and destroy them.
3. **Clotting Factors** – proteins that help stop bleeding when tissue is injured. There are many types of clotting factors, most of which are also produced by the liver.



What is given during a blood transfusion?

To receive a **blood transfusion** means that you will be given a blood component and/or plasma protein product that your healthcare provider has recommended as a part of your medical therapy.

Blood that has not been separated into its different cellular or protein parts is called *whole blood*. Whole blood is not available for transfusion in Canada. However, whole blood is separated into *blood components* and *plasma protein products*, so that you only receive what you need. **If you are about to receive a blood transfusion, this means you are about to receive one (or more) of the following:**

- **Red Blood Cells**
 - **Plasma**
 - **Platelets**
 - **Cryoprecipitate**
 - **Plasma Protein Products (PPP)**, which are proteins purified out of human plasma
- 
- The diagram consists of a vertical list of five bullet points. A large right-facing curly bracket groups the first four items: Red Blood Cells, Plasma, Platelets, and Cryoprecipitate. To the right of the bracket is a rectangular box with a black border containing the text 'These are called blood components'.

Recombinant Products, which are proteins developed in a laboratory and do not contain human source proteins. Because these products do not come from human donors, receiving a recombinant product is not considered to be a blood transfusion.

Where does the blood component or plasma protein product come from?

Canadian Blood Services (CBS) is the national blood supplier for Canada (excluding Quebec) and looks after the collection, testing, processing and storage of donated blood. Every donation is tested by CBS for known transmissible diseases, including HIV, Hepatitis B and Hepatitis C. Blood components are **not** released by CBS for use until all donor transmissible disease testing is completed.

Blood components are produced from blood donated voluntarily by people across Canada. Plasma protein products are made from pooled donor plasma by pharmaceutical companies under stringent conditions to ensure the highest quality and safest product. CBS purchases these products and distributes them to hospitals.

All blood components and plasma protein products are paid for by your tax dollars as a Canadian taxpayer. Health Canada regulates and licenses CBS and all associated laboratories where products manufactured for Canadian use.

When would I receive a blood component transfusion?

Red blood cell transfusions are usually given to patients who don't have enough of their own red blood cells. They may have lost blood during surgery or in an accident. Some people have diseases that cause their bodies to destroy their own red blood cells, or cause patients not to make enough red blood cells in their bone marrow. If your hemoglobin level is low, this means you may not have enough red blood cells to carry oxygen from your lungs to the rest of your body. The purpose of a transfusion of red blood cells is to improve your body's ability to carry oxygen.

Platelet transfusions are usually given to patients who have a very low number of platelets, or who have platelets that do not work properly. In these situations a platelet transfusion may be needed to prevent severe bleeding or treat active bleeding.

Plasma transfusions are usually given to patients who do not have enough of several clotting factors to form a clot properly. A plasma transfusion may be needed to prevent severe bleeding or treat active bleeding.

Cryoprecipitate is used to replace a special clotting protein called fibrinogen if it is low in bleeding patients.

Red blood cells, plasma and platelets for transfusion are packaged in special bags made out of polyvinyl chloride (PVC). Each dose is referred to as a **unit**. Red blood cell, plasma and platelet transfusions are infused through a needle placed into a vein, usually in the arm.

What are plasma protein products?

Your doctor or nurse practitioner may recommend that you receive a plasma protein product. This may be in addition to, or instead of, transfusion of a blood component. Plasma protein products are made from human blood, but undergo many processing steps to inactivate and remove potential disease-causing viruses. Depending on the product needed, plasma protein products may be given through a needle in the vein (intravenous infusion-IV), into the muscle (intramuscular injection-IM) or under the skin (subcutaneous injection-SC).

Plasma protein products prescribed for patients include:

- **Albumin** is a protein made by the liver. It can be given to patients with burns or to treat low blood pressure due to low protein production if the liver is failing. This product is given IV.
- **Intravenous Immune Globulin (IVIG)** is a solution that contains high levels of immunoglobulin (antibodies). It may be given to people who don't have enough antibodies of their own to prevent infections, and in some cases to help control the immune system when it is not working properly (autoimmune disease). This product is given IV or SC.
- **Rh Immune Globulin (RhIg)**, also called WinRho[®], is a solution containing high levels of a special antibody to prevent Rh Negative patients from forming a dangerous antibody. It should be given to pregnant Rh Negative women in their 28th week of pregnancy and after they have given birth, to prevent the antibody from forming and complicating future pregnancies. It may also be given to Rh Negative patients receiving Rh Positive platelets or Rh Positive bone. This product is given IM or IV.
- **Immunoglobulins (Ig)** are antibodies that have been purified out of human plasma to provide immediate, short-term protection against certain infectious diseases. The Ig and will either prevent the infection from occurring or make it less severe. Specific Ig products are available against infections including Hepatitis B, Rabies, Tetanus, and Chicken Pox. This product is usually given IM, and sometimes SC or IV.
- **Prothrombin Complex Concentrate** contains a pool of specific purified clotting factors. This product is used to rapidly reverse the effects of coumarin anticoagulants (for example, Warfarin) due to severe bleeding or the need for urgent surgery. It may also be used to treat severe bleeding associated with the anticoagulants Apixiban, Rivaroxaban or Edoxaban. This product is given IV.
- **Clotting Factors:** People whose bodies do not produce normal amounts of specific clotting factors may be prone to bleeding. Examples of bleeding disorders include hemophilia (factor VIII or factor IX deficiency), Von Willebrand disease (Von Willebrand factor deficiency), or factor XIII deficiency. Products available which replace the missing clotting factors and stop the bleeding may be:
 - **Plasma derived** products, which are made from human blood. These products are given IV.
 - **Recombinant** products, which are made in a laboratory and do not contain any human blood. Some of these products may also be given to people who do not have a known inherited bleeding disorder but are bleeding heavily. These products are given IV.

How long does it take to receive a blood transfusion?

Blood components: Once a unit of red blood cells, plasma or platelets has been selected, it is labeled with your name and hospital number. When your doctor or nurse practitioner requests that it be given to you, your nurse will administer the unit through a needle placed in your vein. It usually takes between 60 minutes and up to 4 hours to give each blood component unit.

Plasma protein products: Depending on the product you need, these can be given by different routes and at varying rates. All infusions should be finished within 4 hours from the time each product is started. If the product is given by subcutaneous or intramuscular injection, administration will take seconds.

Your nurse will observe you closely, in case you develop a transfusion reaction (side effect of transfusion).

What happens if I need a blood transfusion or a blood product?

If your doctor or nurse practitioner prescribes a blood component transfusion or a plasma protein product infusion for you, he or she must explain the benefits and risks of the transfusion of the blood component or plasma protein product, and ask you for your permission or consent to the treatment. These risks and benefits will differ depending on what product you are to receive, and on your illness or condition. If you have any questions or there is anything that you don't understand, you should ask your doctor or nurse practitioner before the transfusion/infusion can take place.

Before receiving a transfusion, a sample of your blood will be sent to the Transfusion Medicine Laboratory. Your ABO and Rh blood group will be **determined and double-checked**. Your blood will also be screened for the presence of antibodies against proteins on red blood cells (**alloantibodies**). Most people don't have these alloantibodies. However, if you have been transfused before, if you have ever been pregnant, or if you may have an autoimmune disorder, your body may have produced these antibodies. If you do have them, the Medical Laboratory Technologists working in the Transfusion Medicine laboratory will identify them and carefully search for blood components that are compatible with your blood and can be safely transfused to you.

What are the risks of receiving a plasma protein product?

Human plasma used to make plasma protein products undergoes rigorous processing to inactivate and remove any potential infections, making them some of the safest products available for transfusion. Risks of receiving plasma protein products are small, and mainly related to the type of product and how the product is administered.

In general, plasma protein products may uncommonly cause mild reactions including fever, abdominal pain or nausea, and hives or skin irritation. Severe allergic reactions are **very rare**. The risk of getting a transmissible disease is **extremely rare**.

Products given by injection into the muscle or under the skin may lead to some redness or soreness at the site of injection.

Your doctor or nurse practitioner will discuss any general and product-specific risks with you before you receive a plasma protein product.



Additional Important Reactions Associated with Specific Plasma Protein Products

Product	Reaction and Risk per infusion
Intravenous Immune Globulin (IVIG)	Headache – 3 in 10 Flu-like symptoms – 5 in 100 Red cell hemolysis (if non-Group O) – 1 in 1 000 Aseptic meningitis – 1 in 10 000 Blood clot – up to 1 in 10 (depending on patient health and risk factors for clots)
Prothrombin Complex Concentrates	Blood clot – at least 1 in 100 (depending on patient health and risk factors for clots)

What are the risks of being transfused a blood component?

Receiving blood components in Canada is very safe. Most people who receive a transfusion don't experience any side effects at all. However, some patients may experience a reaction. Symptoms of a transfusion reaction may include headache, fever, chills, nausea, vomiting, dizziness, hives, itchy skin, and shortness of breath. **If you develop any new symptoms during or after receiving a transfusion, tell nursing staff immediately.**

Mild transfusion reactions are not uncommon. Some reactions are treated with medications like Tylenol[®] (for fevers) or Benadryl[®] (for allergic-type reactions). Reactions tend to develop during the transfusion or up to 6 hours after the transfusion.

Serious complications of blood transfusion are **rare**. A reaction is considered to be rare if it occurs in less than 1 in 1 000 transfusions. The Patient Risk Chart and Transmissible Disease Chart summarize the risk rates of these events.

If I receive a blood transfusion as an outpatient, what should I watch for after I go home?

If you have **any** of these symptoms within 48 hours of a transfusion, report them to your healthcare provider **right away**, or go to the nearest emergency department if symptoms are serious:

- Rash, hives, itching
- Feeling queasy or vomiting
- Difficulty breathing or increased coughing
- Feeling very hot or experiencing fever (38°C or higher)
- Chills
- Back pain
- Red/brown urine

Additionally, if you received IVIg:

- Headache
- Sensitivity to bright light
- Unexpected painful leg swelling



Tell the staff you have recently received a blood component or plasma protein product.

Patient Risk Charts

Transfusion Reaction Risk Chart	
Event	Risk of Event per unit transfused
Development of red blood cell antibodies that can complicate future pregnancy or transfusion	1 in 13
Fever, per pool of platelets	1 in 20
Hives (itchy skin rash)	1 in 100
Fever, per unit of red blood cells	1 in 300
Delayed hemolysis (When your red cells are destroyed because of alloantibodies)	1 in 7,000
Transfusion related acute lung injury (Also called TRALI, this is a serious lung inflammation that may require intensive care unit admission.)	1 in 10,000
Symptomatic bacterial sepsis, per pool of platelets. (Sepsis is when you get a bacterial infection in your blood stream)	1 in 10,000
Wrong ABO (blood) group, per unit of red cells	1 in 40,000
Serious allergic reaction per unit component	1 in 40,000
Death from bacterial sepsis, per pool of platelets	1 in 200,000

Source: Bloody Easy 4; ORBCoN, 2017.

With today's standards of blood donor screening and transmissible disease testing by CBS the risk of infection with a disease like HIV or Hepatitis through a blood transfusion **is extremely rare**.

Canada's blood supply is one of the safest in the world!



Transfusion Transmissible Disease Risk Chart	
Transmissible Disease	Risk of Event, per unit transfused
Hepatitis B Virus (HBV). This virus causes liver inflammation and is spread through contact with infected blood products, needles (injection drug use, tattoos, piercings) and body fluids.	1 in 7.5 million
West Nile Virus (WNV). This virus can cause a severe inflammation of the brain, and is transmitted by mosquitoes.	1 in 1 million
Hepatitis C Virus (HCV). This virus causes liver inflammation and is spread through contact with infected blood products, needles (injection drug use, tattoos, piercings) and body fluids.	1 in 13 million
Chagas Disease. This parasite is endemic to the Southern US, Central America, and South America. It is spread by a type of tick, and can be transmitted through transfusion.	1 in 4 million
Human Immunodeficiency Virus (HIV). This virus attacks the immune system and causes AIDS. It is spread through contact with infected blood products, needles (injection drug use, tattoos, piercings) and body fluids.	1 in 21 million

Source: Bloody Easy 4; ORBCoN, 2016.



The risk of receiving an infected red blood cell is much lower than the risk of being killed in a car accident.

Frequency of Non-Transfusion Associated Events	
Event	Risk
Dying from lung cancer after smoking 1 pack a day for 30 years	1 in 10
Fatal car accident	1 in 10,000
Death by accidental electrocution	1 in 1,000,000
Death by being struck by lightning	1 in 5,000,000

Source: Bloody Easy 4; ORBCoN, 2016.

Are there any alternatives to having a blood transfusion?

If you require elective surgery (your surgery is scheduled well in advance), your surgeon and family doctor or nurse practitioner will work together to ensure that you are as healthy as possible. If you are found to be anemic (have low numbers of red blood cells in your body), your doctor or nurse practitioner may give you iron pills to “build up your blood”. Iron given intravenously may also be an option if iron pills are not effective and you are iron deficient (have low iron stores in the body).

For some patients, particularly those with kidney disease, it may be appropriate to receive a medication called erythropoietin to stimulate the body to produce new red blood cells. It takes several weeks for this medication to take effect. People who are anemic going into surgery are more likely to need red blood cell transfusions than people who are not anemic.

Before your surgery, your surgeon may tell you to stop medications that affect platelet function (such as Aspirin[®], Plavix[®], Ibuprofen [Advil[®]] or Brilinta[®]) or blood clotting proteins, (such as Warfarin [Coumadin[®]], Pradaxa[®], Eliquis[®], or Xarelto[®]). **It is important for you to stop taking them.** These drugs can affect blood clotting ability and may increase your risk of bleeding.

If you have any questions about how medications may affect blood clotting or your platelets, please ask your doctor or nurse practitioner.

There are some means of conserving blood inside the operating room. These include **Acute Normovolemic Hemodilution (ANH)** and **Intraoperative Cell Salvage**.

- **ANH** is when whole blood is removed from the patient at the beginning of surgery, and replaced with an infusion of saline (a salt solution); followed by return of the whole blood to the patient at the end of surgery. This procedure is performed by the anesthesiologist. It is not an option for everyone, but if the use of ANH is planned, it will be discussed with you before your surgery. Usually, you need to be a healthy person to undergo this procedure. Discuss any questions you have with your surgeon or anesthesiologist.
- **Intraoperative cell salvage** is a process which requires a special machine called a *cell saver*. Blood that is lost by the patient during surgery is collected by suction, filtered, and washed by the cell saver machine. The blood is then transfused back into to the patient. Up to 80% of blood lost in the operating room can be recovered. This procedure is not appropriate for everyone and your surgeon or anesthesiologist will discuss the potential for intraoperative cell salvage with you before surgery.

It is important to discuss your feelings about blood transfusion with your surgeon, anesthesiologist and your family.

If you have more questions about alternatives to transfusion, or you have religious or other objections to blood transfusion, your doctor or nurse practitioner may refer you to a specialist with expertise in transfusion medicine.

Can I refuse a blood transfusion?

Yes. However a discussion with your doctor or nurse practitioner must take place because there can be risks associated with refusing blood components and/or plasma protein products. After this discussion, if you choose not to receive any or certain blood components or products, you will be asked to sign a form to ensure hospital staff are aware of your decision to refuse blood altogether, or to accept only certain blood products.

Does artificial blood exist?

No. Most often, when people think about artificial blood, they imagine something that doesn't contain any human blood cells, but still carries oxygen throughout the body. Scientists have not yet been able to design a product like this.

Can I donate my own blood?

Donation of your own blood for transfusion back into you is called **autologous blood donation**. It is only recommended in specific surgical situations and requires the approval of a Medical Officer from CBS. There is no overall benefit to you to donate your own blood weeks before surgery, and then receive it back in the operating room. Autologous blood units can only be transfused back to you, and cannot be given to others. There is still risk involved with autologous transfusion.

Can I donate directly for a family member or friend?

Donation of blood for a specific person is called a **directed donation**. Currently in Saskatchewan, the only persons who may potentially be eligible for this type of donation are parents who would like to provide blood for their minor children. This must be arranged through the child's doctor and Canadian Blood Services, and is not available in emergency situations. These donations need to occur within 4 weeks before a pre-booked surgery. This practice is not encouraged because of the specific risks associated with receiving blood from a blood relative rather than the general donor population. Directed donations are only used for transfusion into a pre-determined patient, and cannot be given to others.

How will I know if I received a transfusion?

If you have been transfused with blood components and/or plasma protein products during your time in hospital, you will receive a transfusion notification at the time you are discharged home. This notification may be in the form of a letter or card. **Please keep this document for your personal health information.** This information assists CBS and the hospitals in notifying you if there were ever any issues with your transfusion.

How do I become a blood donor or volunteer?

If you would like to donate blood, please contact Canadian Blood Services at **1-888-2-DONATE** (1-888-236-6283) or download the GiveBlood mobile app available for iOS or Android devices.



If you can't donate blood you can still help by donating your time and enthusiasm! Volunteers are essential to the success of CBS. Volunteers greet donors and assist them through the donation process, offer refreshments and thanks after donation, recruit donors, coordinate blood clinics in their communities, and much more!

If you have received a transfusion of blood components and/or blood products, your story can inspire new blood donors to make their first donation, or serve as a reminder to regular blood donors. Personal stories about the importance of receiving blood can help motivate and encourage donors to 'Give Life.' Please consider contacting Canadian Blood Services to share your story!

To tell your story as a recipient of a blood transfusion or to become a volunteer, contact Canadian Blood Services at **1-888-2-DONATE** (1-888-236-6283). More information is available on the CBS website www.blood.ca



Contacts for more information about blood transfusion:

Transfusion Safety Officer

Saskatoon Health Region
Transfusion Medicine Lab
RUH Room G502
103 Hospital Drive
Saskatoon, SK S7N 0W8
Phone: 306-655-0988
Fax: 306-655-0987

Transfusion Medicine Physicians

Saskatoon Health Region
Transfusion Medicine Lab
RUH Room G502
103 Hospital Drive
Saskatoon, SK S7N 0W8
Phone: 306-655-1000
Fax: 306-655-2222

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Tissue Transplantation

Your surgeon may have mentioned that you could benefit from receiving a tissue or bone graft during your surgery. Surgeries that involve the skin, eyes, bones and/or muscles may include the use of tissue grafts.

What is a tissue graft?

A *tissue graft* is human tissue (for example: skin, bone, tendon, amniotic membrane) that is donated from one person for transplantation into another person. This donation may have been from a living or deceased donor.

Where does tissue come from?

Donated tissue can come from two types of donation:

1. **Living Donation:** These are tissues that are donated from a living person. Examples include the femoral head from patients having hip replacement surgery, or the amniotic membrane from a placenta after a Cesarean section delivery.
2. **Deceased Donation:** Similar to organ donation, these are tissues that are donated after death. With consent from the deceased donor's family, tissue including bone, tendons, and corneas may be donated.

When would I receive a tissue graft?

Tissue grafts are used during specific procedures. If receiving a tissue or bone graft is part of your treatment or surgery, your surgeon will discuss this with you before the procedure takes place. Your consent for receiving a tissue will be obtained as a part of your consent for procedure or surgery.

What are the risks?

Similar to blood donation, there is a regulated process for screening living and deceased donors and tissue donated in Canada. Health Canada provides requirements for screening and testing of all tissue donors. All tissue banks, including the Saskatoon Health Region, must follow these rules to provide tissue grafts for surgery.

The process for screening living and deceased donors includes a medical and social history, a blood test for infectious diseases, and testing to make sure the tissue graft has not been contaminated. Only after all of these results are received and reviewed, are tissue grafts considered safe to use for surgery.

Even with all the testing and reviews done to make sure the tissue graft is as safe as possible, there may still be risks associated with infection following tissue transplantation. Please talk to your surgeon about these risks and any other concerns you may have about tissue transplantation.

How will I know I received a tissue graft?

Your surgeon should inform you if a tissue graft was used during your surgery.

How can I become a tissue donor?

Almost everyone is eligible to donate organs or tissues.

It is only through the generous gift of organ and tissue donation that we are able to save and improve the lives of others. One deceased organ and tissue donor can save the lives of 8 people and improve the lives of up to 75 others. The donation of bone tissue, or organs such as kidney and liver are also possible from living donors.

Please talk to your family about organ and tissue donation.

Contact information for tissue and bone:

If you have any questions regarding ***your surgery*** and the use of tissue grafts, please contact your surgeon’s office.

If you have any questions regarding ***organ and tissue donation***, please contact the Saskatchewan Transplant Program at 306-655-5054.

Notes or Questions to Ask
