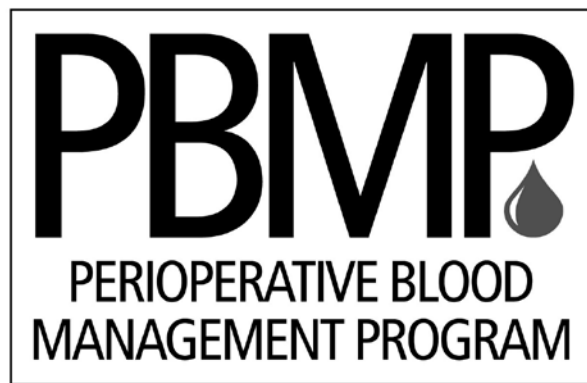


Blood Components, Products, and Alternatives



Blood Components, Products, and Alternatives

What is a blood transfusion?

A blood transfusion is when you receive donated blood. If you have had blood loss from trauma or surgery, or because of certain medical problems, you may need a blood transfusion.

Shortly after blood is donated at Canadian Blood Services, the collected blood is separated into components (parts) and products. This is done so that you only get the parts of the blood your body needs.

Why do I need a blood transfusion?

You may need a blood transfusion to:

- › increase your red blood cells (RBCs). RBCs help carry oxygen to the body's tissues and support the functions of the body.
- › replace clotting factors (proteins) or platelets. This helps to stop bleeding.
- › replace blood loss caused by trauma or injury.
- › replace blood loss caused by a treatment or procedure that lowered your blood cells for a period of time.

Informed consent

Your health care provider may order a blood transfusion of blood components or products for you. If they do, they will explain the benefits and risks of transfusion and ask you to sign a consent form for the treatment. These benefits and risks are different depending on what blood component or product you need, and on your illness or condition.

If you have any questions, or if there is anything that you understand, be sure to ask your health care provider before you sign the consent form.

What can I expect during the transfusion?

- A nurse will check your blood pressure, pulse, and temperature before starting the transfusion. You will get blood through an intravenous (IV) tube. Two nurses will check the blood bag label with your armband at your bedside before starting the transfusion. This is to make sure you are getting the right blood component or product.
- A nurse will check your blood pressure, pulse, and temperature after the transfusion has been running for 15 minutes, and again when the transfusion is done.
- The transfusion will take about 1 to 4 hours. It may take more or less time, depending on what blood component or product you are getting.

How will I know if I am having a reaction?

- You may have a reaction during the transfusion or after the transfusion. Your nurse will watch you closely for a reaction. If you have a reaction during the transfusion, the transfusion will be stopped.
- During your transfusion, **tell the nurse right away if you have any of the following symptoms:**
 - › Bleeding, pain, or new bruising at the IV site
 - › Severe (very bad) back pain
 - › Fever and/or chills
 - › Nausea (feeling sick to your stomach [belly]) and/or vomiting (throwing up)
 - › Rash, hives, itching
 - › Headache, dizziness
 - › Cold, clammy skin
 - › Chest pain
 - › Fast heartbeat
 - › Trouble breathing, wheezing
 - › Dark or reddish urine (pee)
 - › Yellow skin or eyes

If you have any of the above symptoms after your blood transfusion, you may be having a reaction.

- **If you are in the hospital, tell a health care provider right away.**
- **If you have been discharged from the hospital, contact your primary health care provider right away, call 911, or go to the nearest Emergency Department.**

What will happen after the transfusion?

After your transfusion, rest and do not do any strenuous (hard) activity for at least 24 to 48 hours (1 to 2 days). Once you are discharged from the hospital, call your primary health care provider to schedule a followup appointment.

What is blood made up of?

Blood is made up of the following components (parts):

1. Red Blood Cells (RBCs)
2. Platelets
3. Plasma
4. Cryoprecipitate

RBCs, plasma, and platelets are packaged in their own bag made of polyvinyl chloride (PVC). Each dose is called a unit. RBC, plasma, and platelet transfusions are given through an IV tube in your arm.

1. Red blood cells

Red blood cells (RBCs) are the main way that oxygen is carried to the different parts of your body. Red blood cells have hemoglobin, which sticks to oxygen and carries it through your body. “Packed RBCs”, are RBCs that someone has donated. We will test your blood type and you will get blood from someone who matches your type.

Red blood cells



How are RBCs given?

You will get the RBCs through an IV tube in your arm, directly into your blood. You can get RBCs before, during, or after surgery, as needed.

What are the benefits of an RBC transfusion?

RBC transfusion is used to:

- › treat or correct anemia (when you do not have enough RBCs or hemoglobin). Anemia makes it harder to send enough oxygen to all parts of your body.
- › replace blood loss caused by too much bleeding. An RBC transfusion lowers the chance of getting anemia.

What are the possible side effects of an RBC transfusion?

Possible side effects:

- › Hives (1 in 100 people)
- › Fever (1 in 300 people)
- › Heart failure (1 in 700 people)

Less likely side effects:

- › Lung injury (1 in 10,000 people)
- › Delayed breakdown of red blood cells (1 in 7000 people) — This usually happens a few days to several months after transfusion. You may not have any symptoms, or you may have a slight fever that gets better on its own. You may not know you had a reaction or you may have an unexplained drop in blood level. Follow up with your primary health care provider if symptoms continue.

Rare side effects:

- › Having a severe (very bad) allergic reaction (1 in 40,000 people)
- › Getting the wrong blood type (1 in 40,000 people)
- › Bacterial infection (1 in 50,000 people)
- › Death from bacterial infection (1 in 500,000 people)
- › Getting West Nile virus (less than 1 in 1,000,000 people)
- › Getting hepatitis B (1 in 7,500,000 people)
- › Getting hepatitis C (1 in 13,000,000 people)
- › Getting HIV (1 in 21,000,000 people)

2. Platelets

Platelets are a type of blood cell that help blood to clot. If you do not have enough platelets, or your platelets do not work well, you are at risk of bleeding too much, which can cause blood loss.

How are platelets given?

Platelets are given through an IV tube in your arm, directly into your blood.

What are the benefits of a platelet transfusion?

The platelets will help your blood clot so you do not bleed too much.

Platelets



What are the possible side effects of a platelet transfusion?

- The possible side effects of a platelet transfusion are the same as for an RBC transfusion (see page 4).
- The risk of fever, lung injury, and bacterial infection is higher than with an RBC transfusion.

3. Fresh frozen plasma

- Plasma is the liquid part of your blood. It is called frozen plasma because it is frozen within 24 hours (1 day) of being collected. It can be stored this way for up to 1 year.
- Plasma is made up of water, proteins, and electrolytes (salts). Some of the proteins in your plasma help your blood to clot.

How is plasma given?

You will get plasma through an IV tube in your arm, directly into your blood.

What are the benefits of a plasma transfusion?

Plasma will replace the proteins that help your blood clot if they are not working or have been destroyed so you do not bleed too much.

What are the possible side effects of a plasma transfusion?

- The possible side effects of a plasma transfusion are the same as for an RBC transfusion (see page 4).
- Plasma transfusions can cause hypothermia (a drop in body temperature) or other metabolic (energy) problems if you have been given a lot of plasma.

Fresh frozen plasma



4. Cryoprecipitate

Cryoprecipitate (“cry-o-pre-sip-i-tate”) is made of specific proteins and fibrinogen. It has proteins that help your blood to clot. It is made by freezing and thawing plasma, and collecting a small amount of protein that forms a layer on top.

How is cryoprecipitate given?

You will get cryoprecipitate through an IV tube in your arm, directly into your blood.

Cryoprecipitate



What are the benefits of a cryoprecipitate transfusion?

Cryoprecipitate can help if:

- › you are bleeding a lot.
- › you have small amounts of fibrinogen (protein that helps blood to clot).
- › you have a blood clotting disorder.
- › you have low levels of clotting factors.
- › your clotting factors are not working properly.

What are the possible side effects of a cryoprecipitate transfusion?

The possible side effects of a cryoprecipitate transfusion are the same as for an RBC transfusion (see page 4).

What are blood products?

- Your primary health care provider may recommend that you receive a blood product in addition to, or instead of, a blood component transfusion. Blood products (also called fractionation or plasma products) are medications made from human blood.
- Blood products commonly prescribed in the hospital include:
 - › Plasma-derived medications
 - › Hemostatic products and sealants

Plasma-derived medications

Plasma-derived medications are made by drug companies from plasma. These include:

1. Albumin
2. Fibrinogen concentrate
3. Plasma protein concentrate (Octaplex®/Beriplex®)
4. Feiba®

1. Albumin

Albumin is the main protein in the blood. It is made by the liver and sent throughout the body. You may need albumin if you have burns or low blood pressure.

How is albumin given?

- You will be given albumin through an IV tube in your arm, directly into your blood.
- Albumin transfusions do not need to be matched to your blood type.

What are the benefits of albumin?

Albumin can help if you need more fluids in your body, such as blood or plasma. Adding albumin to your blood brings fluid into your bloodstream from other parts of your body.

What are the possible side effects of albumin?

- Rarely, albumin may cause a severe allergic reaction.
- You may have too much or too little fluid in your body.
- Albumin has NOT been associated with the transmission of any viruses.

Albumin



2. Fibrinogen

Fibrinogen is a blood protein made by the liver that helps blood clot. You may need fibrinogen if you have low levels of fibrinogen or if your fibrinogen is not working properly.

How is fibrinogen given?

- You will be given fibrinogen through an IV tube in your arm, directly into your blood.
- Fibrinogen transfusions do not need to be matched to your blood type.

What are the benefits of fibrinogen?

Fibrinogen helps to increase your blood's ability to form clots and lowers the risk of bleeding.

Fibrinogen



What are the possible side effects of fibrinogen?

Fibrinogen may cause chills, fever, nausea, vomiting, or an allergic reaction.

3. Plasma protein concentrates (Octaplex®/Beriplex®)

Octaplex®/Beriplex® is made up of blood clotting factors and proteins.

How is Octaplex®/Beriplex® given?

You will get Octaplex®/Beriplex® through a tube in your arm, directly into your blood. You can get Octaplex®/Beriplex® before, during, or after surgery, as needed.

Octaplex®



What are the benefits of Octaplex®/Beriplex®?

If you take medication to thin your blood, you may need Octaplex®/Beriplex® to reverse the effect of the medication. For example, if you have a lot of bleeding or need to have a procedure that might cause bleeding. Sometimes a second dose may be needed if bleeding continues.

What are the possible side effects of Octaplex®/Beriplex®?

- Octaplex®/Beriplex® may cause headaches or an allergic reaction (like hives, fever).
- Rarely, you may get a disease or virus.

4. Feiba®

Feiba® is made up of clotting factors and proteins specifically for patients with hemophilia A or B. It is used to control and prevent bleeding episodes in people with hemophilia A or B.

How is Feiba® given?

You will get Feiba® through an IV tube in your arm, directly into your blood. You can get Feiba® before, during, or after surgery, as needed.

What are the benefits of Feiba®?

You may have antibodies (inhibitors) which stop your blood factor replacement treatment from working. Feiba® prevents this, letting your treatment work.

What are the possible side effects of Feiba®?

Feiba® may cause:

- › Low red blood cells
- › Diarrhea (loose, watery poop)
- › Bleeding into a joint
- › A positive test for hepatitis B surface antibodies – This does not mean you have hepatitis B. It means you may have received hepatitis B antibodies from the transfusion. If you were not immune to hepatitis B before receiving Feiba®, this does not mean that you are now immune.
- › Nausea
- › Vomiting
- › An allergic reaction
- › Clotting events involving blocked blood vessels, such as stroke, blocked blood vessels to the lungs, and deep vein blood clots

Hemostatic products and sealants

Hemostatic products and sealants are used during surgery to lower bleeding and blood loss, and help with blood clotting. These products include:

1. Fibrin sealant (such as Tisseel®, Evicel®)
2. Hemostatic matrix (such as Floseal®, Surgiflo®)
3. Intravenous immune globulin
4. Rh immune globulin
5. Clotting factors

1. Fibrin sealant (such as Tisseel®, Evicel®)

- Fibrin sealants are made up of proteins involved in blood clotting. These include clotting factors called thrombin and fibrinogen. Fibrin sealants may also have components to make sure blood clots do not break down quickly.
- **Fibrin sealants have a very small amount of human plasma.**

How are fibrin sealants given?

Fibrin sealant is sprayed on the part of your body that is bleeding using a syringe. Fibrin sealant is a topical (surface) medication. It does not go into your arteries or veins.

What are the benefits of fibrin sealants?

A fibrin sealant is used during surgery if your blood clotting proteins are not working well. The blood clotting proteins in the sealant form blood clots to stop blood and other fluids from leaking.

What are the possible side effects of fibrin sealants?

Fibrin sealants may cause:

- › An allergic reaction
- › Infection
- › A disease
- › A virus

2. Hemostatic matrix (such as Floseal®, Surgiflo®)

- Hemostatic matrix is made up of gelatin and human thrombin. Gelatin is a protein found in many parts of your body. Thrombin is a protein that helps your blood to clot.
- Hemostatic matrix has a very small amount of human plasma.

How is hemostatic matrix given?

Hemostatic matrix is put on the part of your body that needs it using a syringe.

What are the benefits of hemostatic matrix?

Hemostatic matrix can stop bleeding in 2 minutes by forming a very strong clot. The gelatin fills in the wound, then the thrombin causes a clot to form around the gelatin.

What are the possible side effects of hemostatic matrix?

Hemostatic matrix may cause:

- › An allergic reaction
- › Clotting inside a blood vessel – Symptoms of a blood clot include swelling, pain, tenderness, warmth, or a reddish colour in your arm or leg. Symptoms of an arterial clot include severe pain, paralysis (not being able to move) of a body part, or both. This can lead to a heart attack or stroke. A blood clot in a vein is called a venous clot. This type of clot may build up slowly over time, but can still be life-threatening. The most serious type of venous clot is called deep vein thrombosis (DVT).
- › Infection
- › A disease
- › A virus

3. Intravenous immune globulin (IVIG)

- Intravenous immune globulin (IVIG) is a solution that has high levels of immunoglobulin (antibodies). You may need IVIG if you do not have enough antibodies to prevent infections or have low immunity.
- **IVIG is made from human blood.**

How is IVIG given?

You will get IVIG through an IV tube in your arm, directly into your blood.

What are the benefits of IVIG?

It is given to people who do not have enough antibodies of their own to prevent infections and to people with low immunity.

What are the possible side effects of IVIG?

IVIG has **NOT** been associated with the transmission of any viruses.

4. Rh immune globulin

Rh immune globulin (such as WinRho[®], RhoGAM[®]) is a solution with high levels of a special antibody.

How is Rh immune globulin given?

You will get Rh immune globulin through an IV tube in your arm, directly into your blood.

What are the benefits of Rh immune globulin?

You may need Rh immune globulin if you:

- › have certain immune disorders, such as low platelets
- › are pregnant and Rh-negative, and are having an Rh-positive baby. Rh immune globulin will be given in week 28 of your pregnancy and after you give birth. This will help prevent your body from producing Rh antibodies which would attack the Rh-positive baby's RBCs. In this situation, it is usually given as an intramuscular (into the muscle) injection using a needle.
- › Your baby may need Rh immune globulin if they are Rh-positive. Rh immune globulin is used to prevent Rh disease (a disease in newborns related to RBC breakdown).

What are the possible side effects of Rh immune globulin?

Rh immune globulin may cause:

- › Muscle pain or tenderness at the injection site
- › Skin reactions (like a rash or itching)
- › Chills
- › Fever
- › Headache

5. Clotting factors

- Clotting factors are special immunoglobulin solutions.
- **Clotting factors are made from human blood.**

How are clotting factors given?

You will get clotting factors as an injection using a needle in your muscle or vein.

What are the benefits of clotting factors?

Clotting factors are used to prevent you from developing a disease, such as hepatitis B or chicken pox, after you have been exposed to it.

What are the possible side effects of clotting factors?

Clotting factors may cause:

- › Clotting inside a blood vessel – Symptoms of a blood clot include swelling, pain, tenderness, warmth, or a reddish colour in your arm or leg. Symptoms of an arterial clot include severe pain, paralysis (not being able to move) of a body part, or both. This can lead to a heart attack or stroke. A blood clot in a vein is called a venous clot. This type of clot may build up slowly over time, but can still be life-threatening. The most serious type of venous clot is called deep vein thrombosis (DVT).

Recombinant medications

- Recombinant medications are made in a lab. **They do not have any human plasma in them.**
- Examples of recombinant medications include:
 1. **Recombinant Factor VIIa (NiaStase RT®)**
 2. **Eprex® (Erythropoietin)**

1. Recombinant Factor VIIa (NiaStase RT®)

- Factor VIIa is a protein that is very important in blood clotting. NiaStase RT® is produced from baby hamster kidney cells and converted into the active form of recombinant factor.
- **Recombinant Factor VIIa does NOT contain any human blood components.**



How is Recombinant Factor VIIa given?

You will get Recombinant Factor VIIa through an IV tube in your arm, directly into your blood.

What are the benefits of Recombinant Factor VIIa?

You may need Recombinant Factor VIIa if you have a rare bleeding disorder like hemophilia. Hemophilia makes it hard to control bleeding. Recombinant Factor VIIa can help hemophilia patients who develop inhibitors against regular Factor VIII or Factor IX. Recombinant Factor VIIa can help the blood to clot and lower the risk of bleeding a lot. A lower risk of bleeding may lower the need for an RBC transfusion.



What are the possible side effects of Recombinant Factor VIIa?

Rarely, you may have:

- › Headache
- › Dizziness
- › Blurred vision
- › Blood clots
- › Pain, redness, or irritation at the injection site
- › Allergic reaction
- › Fever
- › Vomiting
- › Swelling
- › Pain in the joints

The following side effects are very rare:

- › Pain in the legs or groin
- › Slowed heartbeat
- › Unusual weakness or tiredness
- › Your body makes less pee

2. Eprex® (erythropoietin)

- Erythropoietin is a hormone in the kidneys that stimulates your body to make red blood cells. Eprex® is a medication that works like erythropoietin.
- **Eprex® does NOT have any human blood components.**

How is Eprex® given?

You will get Eprex® through an injection in your arm using a needle. The Eprex® will make its way to your blood. You will get Eprex® before and/or after surgery.

What are the benefits of Eprex®?

Eprex® causes your body to make more RBCs, which may lower your need for an RBC transfusion. Eprex® increases the hemoglobin level in your blood.

What are the possible side effects of Eprex®?

- **You should not take Eprex® if you have high blood pressure.** Eprex® can make your blood thicker and cause even higher blood pressure.
- In some **rare cases**, your bone marrow may stop making RBCs. If this happens, you will need transfusions on an ongoing basis.

Alternatives

Alternatives may be used instead of transfusions of blood components and blood products. Alternatives include:

1. **Intraoperative Cell Salvage**
2. **Acute Normovolemic Hemodilution (ANH)**
3. **IV Iron**
4. **Antifibrinolytic Medications (Tranexamic Acid)**
5. **Vitamin K**
6. **Desmopressin (DDAVP)**

1. Intraoperative Cell Salvage

Intraoperative cell salvage is a device used during surgery. The device collects the blood you lose during surgery, cleans it, and returns it back to you. Up to 80% of the RBCs you lose during surgery can be returned to you.

How is intraoperative cell salvage done?

Before surgery, a cell salvage device is set up in the operating room. During surgery, the blood you lose is collected using suction. Instead of throwing the blood away, the cell salvage device saves it, cleans the cells, and removes broken cells. This blood is collected into a bag and given back to you through an IV tube in your arm that goes directly into your blood.

What are the benefits of intraoperative cell salvage?

Intraoperative cell salvage lowers the need for an RBC transfusion from a donor.

What are the possible side effects of intraoperative cell salvage?

Your RBCs may break down or it may interfere with how your blood clots.

2. Acute Normovolemic Hemodilution (ANH)

ANH is done in the operating room at the start of your surgery. Some of your blood is removed and stored in a blood bag. The blood is given back to you when the bleeding has stopped.

How is ANH done?

You are put to sleep before surgery. Blood is then taken from you through an IV tube into a bag and replaced with a fluid that does NOT contain any human blood components. The fluid is added to keep the same amount of liquid in your blood vessels. During surgery, your blood is placed on a machine that rocks back and forth to keep the blood from clotting. When bleeding has stopped, the blood is given back to you through an IV tube in your arm that goes directly into your blood.

Intraoperative
Cell Salvage



What are the benefits of ANH?

- ANH may lower the need for RBC transfusions from a donor. This lowers the risk of side effects that come from a RBC transfusion (see page 4).
- You may not lose as many red blood cells as you normally would during surgery.

What are the possible side effects of ANH?

You should not have ANH if you have anemia (low number of red blood cells or hemoglobin, which makes it hard to deliver oxygen to the body).

3. IV iron

- Iron plays an important part in keeping your body healthy. Your body needs iron to make hemoglobin, a part of the blood that carries oxygen to different parts of your body. Some people do not make enough iron, and need IV iron.
- **IV iron does NOT have any human blood components.**

How is IV iron given?

You will get IV iron through an IV tube in your arm, directly into your blood.

What are the benefits of IV iron?

If you have low iron, IV iron will help you make hemoglobin. The hemoglobin will make sure that enough oxygen is delivered to all parts of your body. Using IV iron may lower your risk of needing an RBC transfusion.

What are the possible side effects of IV iron?

Too much iron is toxic (harmful) to the body. If you have too much iron (iron overload), it can damage your stomach, intestines, heart, and liver. Your health care team will make sure you are getting the right amount of iron.

4. Antifibrinolytic medications (Tranexamic Acid)

- Antifibrinolytic medications are chemicals that slow or prevent the breakdown of blood clots. Antifibrinolytics are used to decrease bleeding during surgery.
- **Antifibrinolytic medications do NOT have any human blood components.**

How are antifibrinolytic medications given?

You will get antifibrinolytic medications through an IV tube in your arm, directly into your blood. You will get an antifibrinolytic medication during your surgery.

What are the benefits of antifibrinolytic medications?

Using antifibrinolytic medications during surgery lowers blood loss. Less blood loss lowers the need for a transfusion. This lowers your risk of possible side effects from an RBC transfusion (see page 4).

What are the possible side effects of antifibrinolytic medications?

Antifibrinolytic medications (Tranexamic Acid) may cause:

- › Rare allergic reactions, such as heart failure or heart attack
- › Digestive system upset, such as nausea, vomiting, constipation (not being able to poop), diarrhea, stomach pain, or skin flushing (redness, usually on the face, that does not last very long)
- › Greater risk of blood clots in the legs and lungs

5. Vitamin K

- Vitamin K is a fat-soluble vitamin. It can change proteins involved in blood clotting to their active forms. It is rare to not have enough vitamin K in your body because it is found naturally in many foods.
- **Vitamin K does NOT have any human blood components.**

How is vitamin K given?

You will get vitamin K through an injection in your arm using a needle or by mouth. The vitamin K will make its way to your blood. You will get vitamin K before and/or after surgery.

What are the benefits of vitamin K?

If you do not have enough vitamin K, your blood clotting may not work properly. You will get vitamin K to help your blood clot.

What are the possible side effects of vitamin K?

Vitamin K may cause an allergic reaction.

6. Desmopressin (DDAVP)

- Desmopressin is a medication that works on the kidneys and blood vessel walls. It helps you to:
 - › retain (keep) water.
 - › release blood clotting factors stored in the cell walls of some blood vessels.
- This can help in certain blood clotting disorders.
- **Desmopressin does NOT have any human blood components.**

How is desmopressin given?

You will get desmopressin through an IV tube in your arm, directly into your blood.

What are the benefits of desmopressin?

Desmopressin helps your blood to clot if you have a blood clotting disorder.

What are the possible side effects of desmopressin?

Desmopressin may cause:

- › Headaches
- › Skin flushing
- › Nausea

Ways to save blood

Restricting diagnostic phlebotomy (blood tests)

Only blood tests that you need will be done. This helps lower the amount of blood that is taken. This may mean doing some tests a couple of times a week instead of every day. This will help to keep your hemoglobin up and make it less likely that you will need an RBC transfusion.

Pediatric sampling (using smaller volume blood sample tubes)

When testing children, we take a smaller amount of blood than usual for each sample sent to the lab for testing. These blood tubes can be used to draw blood in adults.

For more info on other blood products and ways to save blood, visit:

- › www.cdha.nshealth.ca/perioperative-blood-management

