HÉMA-QUÉBEC

CIRCULAR OF INFORMATION

For the use of labile blood products

OCTOBER 2023

WARNING :
The risk of transmitting known and unknown infectious disease agents is present in the transfusion of labile blood products. Careful donor selection and available laboratory tests do not completely eliminate this risk. Also, several other risks are associated with transfusion.
The known risks are described in this Circular of Information.

Table of contents

NOTICE TO USERS

This Circular of Information is intended to complement the information provided on labile blood product (LBPs) bag labels.

Like many other medical acts, the transfusion of LBPs involves risks, as does deciding not to transfuse. LBPs are human biological products intended for use in the treatment of patients. Based on professional judgement and clinical evaluation, the physician must determine the selection of components, dosage, and the rate of administration. Attention to the specific indications for LBPs is needed to prevent inappropriate transfusions.

This Circular of Information should not be considered or interpreted, in whole or in part, as an explicit or implicit guarantee of the safety of LBPs.

Given the risks associated with transfusion, physicians must be familiar with other current alternatives to transfusion.

This Circular of Information is being distributed to conform to applicable regulations issued by the Health Products and Food Branch of Health Canada, in accordance with the Food and Drugs Act, the Guidance Document: Blood Regulations and the guidance CSA Z902 – Blood and blood components. Additions to the Circular will be issued regularly to complete/update it between revisions.

An electronic version can be found on Héma-Québec's website.

I. GENERAL INFORMATION

A. QUALITY AND SECURITY

A.1 Donor eligibility

The LBPs described in this Circular have been collected from eligible volunteer donors who have:

- been advised of high-risk behaviours exposing them to diseases potentially transmitted through blood;
- filled out a questionnaire intended to screen out high-risk donors;
- satisfied minimum physiological criteria set out in *Héma-Québec's Donor Selection Criteria Manual*;
- were informed that, if they think, for any reasons, that their blood should not be transfused to a patient, they should advise Héma-Québec immediately.

A.2 Preventive measures

The puncture site is disinfected with an antiseptic solution before the needLe is inserted.

The first 40 millilitres of blood are shunted into a pouch to reduce the risk of bacterial contamination.

A.3 Testing of donor blood

Laboratory tests are done on each blood donation before the LBPs are placed in inventory.

Table I.1 Tests done on donor blood

Agents	Ac	Ag	NAT
HIV 1/2[1]	✓	N/A	N/A
HIV p24	N/A	✓	N/A
HIV-1 and HIV-2	N/A	N/A	✓
HAV	N/A	N/A	✓
HBV	✓[2]	✓	✓
HCV	✓	N/A	✓
HTLV I/II	✓	N/A	N/A
Syphilis	✓	N/A	N/A
CMV	✓[3]	N/A	N/A
VNO	N/A	N/A	✓[4]
Chagas or Trypanosoma cruzi[5]	✓	N/A	N/A
Parvovirus 19[6]	N/A	N/A	✓

N/A Not applicable. [1]Including Group O HIV-1 [2]Anti-HBc. [3]Done on a portion of the inventory. [4]Test performed on each donation during the WNV transmission season (generally from May 31st to November 30th). Outside this period, performed if travel outside of Canada in the last 56 days. [5]Test perform if the donor presents risk factors for Chagas disease (born in an endemic country, mother or maternal grandmother born in an endemic country, travelled to or resided in an endemic country for 30 consecutive days or more).

Tests are also done on each donation to determine the ABO and Rh groups (D and weak D antigens), and to screen for clinically significant irregular antibodies.

All platelet products are tested by bacterial culture (aerobic and anaerobic) 48 hours after collection. An additional 12 hours of incubation is required before distribution.

A.4 Labelling of LBPs

Labels contain the following information:

Table I.2 List of information on the label

Information	Bar code
1. Official name of LBP, including any qualifications and/or attributes	N/A
2. Product code in ISBT format	✓
3. Donation identification number, including establishment code	✓
4. Blood group; donor's ABO group and, where applicable, Rh group in ISBT format. When "Rh negative" is indicated, the blood has been found negative for both D and weak D antigens	✓
5. Date and time of collection (except for pooled platelets : date and time of pool preparation)	✓
6. Expiration date and time	✓
7. Method by which the LBPs were prepared	N/A
8. Temperature range at which the LBPs must be stored	N/A
9. Preservatives and anticoagulants used	N/A
10. Real product volume	N/A

Information	Bar code
11. Type of donation (autologous)	✓
12. General statements regarding this Circular of Information and infectious disease risks	N/A
13. Manufacturer's name and the establishment license number	N/A
14. Sedimenting agent used during Granulocytes Apheresis	N/A
15. Red blood cell phenotypes[1,2]	✓
16. Platelets genotypes[1]	✓
17. Red blood cells genotypes (rare blood)[1]	✓
18. T.E.N.D / H.T.N.D. : Titre élevé non détecté / High Titer Not Detected	✓
19. CMV related information	✓
20. IgA deficient plasma related information	✓

✓ Information encoded in an ISBT structure. [1]If blood analyses are performed. [2]Females 45 years and under, with child bearing potential, should be transfused with K (also known as K1 or Kell) negative red cell units unless they are known to be K positive. To meet demand, Héma-Québec performs Kell phenotyping of these donors' red blood cells.

A.5 Side effects and risks of LBP transfusions

A.5.1 Infectious diseases

A.5.1.1 Transmission of infectious diseases

Transmission of infectious diseases may occur in spite of careful donor selection and testing of blood as described in table I.1.

However, the tests listed above should prevent most post transfusion cases of hepatitis, HIV, HTLV I/II and WNV infections. The table below describes the current residual risk.

Table I.3 Residual risks in Quebec

Virus	Residual risks*
HCV	1/25,414,765
HIV	1/31,824,560
HBV	1/1,961,690
HTLV	1/11,458,513
WNV	Variable from year to year**

*Residual risks were calculated based on the incidence of these infections in Héma-Québec donors for the period of Mat 1st 2011 to April 30th 2021. **Off season, the risk is negligible.

The current risk of septic reaction due to bacterial contamination of the products is less than 1/500,000 for platelets and red blood cells.

Cytomegalovirus (CMV) can be transmitted through cellular blood products (red blood cells, platelets, granulocytes). Since these products are partially depleted leukocytes (except granulocytes), the risk of transfusion is negligible for CMV. The only indications suggested by the National Advisory Committee on Transfusion Medicine (CCNMT) for the use of CMV negative products are:

1) Granulocytes transfusion to CMV antibody-negative recipient or with unknown status;

2) Intrauterine transfusion.

Babesiosis was the most reported post transfusion infection in the United States until 2019, the year screening was introduced. This infection is not screened for in Québec or in Canada.

Only one case of post transfusion Babesiosis has been reported in Canada. In a study on 35,000 donors in Canada, only three positive cases were found in Manitoba and none in Québec.

Other infectious agents transmitted by transfusion (although rarely in North America) include *Trypanosoma cruzi* (Chagas disease agent), *Plasmodium spp* (malaria agent), *Anaplasma phagocytophilum, Toxoplasma gondii, Coxiella burnettii* (Q-fever agent), *Rickettsia rickettsii* (Rocky Mountain spotted fever agent), *Borrelia spp* (agent responsible for recurring tick fever), *Treponema pallidum* (syphilis agent), parvovirus B19, *Leishmania spp*, *Brucella spp*, hepatitis A virus, hepatitis E virus, Colorado tick fever, dengue fever virus, Zika virus, Japanese Encephalitis, Ross River virus, Epstein-Barr virus and HHV-8. Although the possibility of transmission of TTV and HPgV-1 viruses by transfusion has been demonstrated, it was not documented that these were associated with human pathologies.

With respect to malaria and some vector-borne viruses, such as Zika, dengue fever virus and chikungunya virus, the risk is significantly reduced by temporarily excluding donors who have travelled to endemic areas. Héma-Québec constantly monitors for emerging microorganisms to ensure the safety of LBPs.

A.5.1.2 Bacterial contamination

Transfusion of bacterially contaminated LBPs can cause serious reactions, including shock and even death. Such reactions have been reported, mainly following the transfusion of platelets and, to a lesser extent, following the transfusion of red blood cells. Contaminations attributed to the transfusion of plasma are extremely rare.

When a blood recipient experiences significant chills, high fever (> 39 °C), and/or hypotension during or immediately after transfusion, or clinical manifestations compatible with a bacterial infection (fever, chills, hypotension, shock, dyspnea) the possibility that the transfused LBPs may have been bacterially contaminated must be considered. Septic reactions may be life-threatening.

Appropriate treatment should be administered immediately after collecting blood samples from the recipient and the LBPs for culturing.

If the remaining quantity of the product is not sufficient, it is recommended to inject culture medium directly into the pouch, to perform a gram stain and inoculate the agar and the blood culture bottles. The pouch containing the blood product should always be sealed in a sterile manner on the care unit before transport to the laboratory. Samples should always be handled in such a way as to avoid external contamination. The samples analyzed in the laboratory must come from the pouch and not from a segment. The blood bag and the bacterial isolates must be preserved until an investigation is completed. Such cases should be reported immediately to Héma-Québec, as per the instructions in Section A.6, *Reporting Serious Adverse Reactions*.

A.5.2 Classical and variant forms of Creutzfeldt-Jakob disease

Although no cases have yet to be documented, there is no evidence that the classical form of Creutzfeldt-Jakob disease can be transmitted, as for the variant form of Creutzfeldt-Jakob disease (vCJD), four cases of transmission by non-leukoreduced LBPs were reported in the United Kingdom between 1996 and 1999. No new cases have been noted since then.

A.5.3 Non-infectious transfusion reactions

Transfusion of blood products may cause reactions in recipients to variable frequencies depending on the type of transfused products and the clinical condition of the recipients. A table describing the frequency of transfusion reactions reported to the Quebec hemovigilance system can be found in the appendix.

A.5.3.1 Febrile non-hemolytic reaction

Febrile non-hemolytic reaction is characterized by fever (oral temperature increase of at least 1°C and reaching up to 38.5 °C or higher) occurring during or at least 4 hours after the end of the transfusion. Despite the name of the reaction, fever may not be present but it may be accompanied by chills, nausea and vomiting. It can not be explained by the underlying condition of the recipient or by another cause such as bacterial contamination or hemolysis.

Febrile non-hemolytic reactions occur frequently and are usually benign. It is likely that the presence of inflammatory and pro-inflammatory products secreted by leukocytes in labile blood products (LBPs), such as cytokines, is the cause of these reactions.

A.5.3.2 Hemolytic reactions

Hemolytic transfusion reactions usually occur when the donor's red blood cells and the recipient's plasma are incompatible. Undetected serological incompatibilities can cause these reactions, but several immediate reactions occur when clerical or identification errors lead to an ABO mismatch. These reactions can also be caused by mechanical problems when warming or storing the blood bag (thus resulting in the transfusion of already hemolyzed red blood cells). Consulting the donor's transfusion summary helps reduce the risk by identifying previously screened anti-erythrocyte antibodies in the recipient.

A.5.3.2.1 Immediate hemolytic reaction

This reaction occurs during the transfusion or within 24 hours. The main signs or symptoms are fever, chills, hypotension and hemoglobinuria. In more severe cases, there may be various pains (thoracic, lumbar or abdominal), nausea and vomiting, dyspnea, diffuse bleeding and renal failure.

There may also be a decrease in hemoglobin, haptoglobin, a rise in bilirubin and LDH (lactate dehydrogenases). This reaction can be fatal.

The immediate hemolytic reaction is most often due to an incompatibility other than ABO but may also be due to the latter. ABO incompatibility is usually the result of human error (poorly identified sample or recipient). Occasionally, an immediate hemolytic reaction can be related to ABO incompatibility between the transfused plasma and red blood cells of the recipient, due to the presence of isohemagglutinins in a plasma or platelet product. Finally, the presence of certain irregular erythrocyte antibodies or concomitant administration of a hypotonic fluid or excessive heating of the product may cause such a reaction.

A.5.3.2.2 Delayed hemolytic reaction

Delayed hemolytic reaction can occur more than 24 hours and up to 28 days after transfusion and is manifested by an unexplained fall or inadequate increase in hemoglobin. Signs and symptoms may include reddish or dark urine or jaundice, in addition to symptoms like anemia. With respect to biological parameters, there may be a decrease in haptoglobin,

elevated bilirubin and LDH. The delayed hemolytic reaction is usually due to the presence of erythrocyte antibodies not detected by pre-transfusion analysis. It occurs in people previously immunized by pregnancy or previous transfusions.

A.5.3.3 Delayed serological reaction or development of irregular antibodies

This reaction is characterized by the development of irregular antibodies, without any clinical or biological signs of hemolysis.

There is a risk of hemolytic reaction, if red blood cells transfused previously have on their surface the antigen against which the antibodies are directed.

When erythrocyte alloimmunization is observed, LBPs negative for the antigens against which the recipient is immune should be used to avoid reactions during subsequent transfusions.

Some groups of patients are at greater risk of developing irregular antibodies, such as patients with autoimmune haemolytic anemia or sickle cell anemia. Special measures may be taken for these patients to reduce the risk of alloimmunization. Consulting the donor's transfusion summary and identifying previously identified anti-erythrocyte antibodies help reduce the risk.

A.5.3.4 Allergic Reactions

Allergic reactions appear during or within 4 hours following transfusion. Several possible etiologies exist, such as the passive transfer of IgE from donor to recipient or the transfer of an allergen contained in the plasma of a donor to an already sensitized recipient. In most investigations, the precise etiology is rarely identified. The interaction between elements present in the recipient's blood and certain factors found in the transfused product probably plays a role. It could also be due to passive transfer of IgE-class antibodies during transfusion. IgA deficiency is not a frequent cause of allergic reaction. For a recipient with severe IgA deficiency (<0.05 mg / dL confirmed by a test with proven sensitivity, such as that available at Héma-Québec), in whom an anti-IgA antibody has also been identified and who already had a major post-transfusion allergic reaction, the use of washed red blood cells or products from IgA-deficient donors should be considered.

A.5.3.4.1 Minor allergic reaction

This mild but frequent reaction presents with mucocutaneous manifestations (erythema, urticaria, pruritus, edema, etc.) with or without gastrointestinal symptoms (nausea, vomiting, and diarrhea) without any sign of obstruction of the airways, larynx or cardiovascular involvement.

A.5.3.4.2 Major allergic reaction

Signs and symptoms of major allergic reaction are identical to those of minor allergic reactions but with the addition of laryngeal symptoms (angioedema, etc.), cardiovascular symptoms (hypotension requiring intervention, etc.), respiratory obstruction or other signs characteristic of anaphylactic shock, such as a severe drop in arterial blood pressure and loss of consciousness. It can appear as soon as a few millilitres have been transfused.

A.5.3.5 Pulmonary complications

A.5.3.5.1 Transfusion-related acute respiratory syndrome (TRALI)

Type 1 TRALI is characterized by the sudden onset of signs and symptoms of acute respiratory distress accompanied by hypozema and bilateral pulmonary infiltrates noted on a chest x-ray, occurring during the transfusion or within six hours following transfusion in a recipient without any evidence of acute post transfusion pulmonary edema or other risks for acute lung injury.

If there is another risk factor for acute lung injury (ALI), the term possible Type 2 TRALI is used. This definition was established in 2019 by a committee of international experts and is now accepted worldwide.

Several pathophysiological mechanisms can result in TRALI reactions: the presence of anti-HLA and anti-granulocyte antibodies in the recipient reacting to antigens present in the blood product, the presence of biologically active lipids in the product transfused, or again the transfer of anti-HLA and anti-granulocyte antibodies from the donor to the recipient. Since these antibodies are most often present in multiparous women, Héma-Québec introduced in 2008, various measures depending on the products and the type of collection (whole blood or apheresis) to reduce the risks associated with plasma and platelets transfusion. For the implementation of these measures, questions relating to prior pregnancies have been added to the donor file. These measures are as follows :

- **Whole blood donation:**

Only plasma from male donors and women without a history of pregnancy is used for transfusion purposes. This measure is also applied for

cryoprecipitate, cryosupernatant and IgA-deficient plasma. In exceptional cases IgA-deficient plasma may be used from donors with a history of pregnancy, given the rarity and peculiarity of this type of donation.

Platelets are produced from the whole blood of men and of women without a history of pregnancy.

- **Apheresis donation**

For plasma and platelets in the apheresis program, all product donations from male donors and women without a history of pregnancy are used for transfusion purposes. However, platelets from HLA-compatible and HPA-typed donors with a history of pregnancy can be used, given the rarity and peculiarity of this type of donation.

A.5.3.5.2 Acute post transfusion pulmonary edema

The definition of acute post transfusion pulmonary edema, formerly known as "circulatory overload", was reviewed and approved in 2018 by the highest international authorities on hemovigilance. This proposed name change was adopted in Québec in 2023. The overload is observed by the appearance, during or within 12 hours following transfusion, of acute respiratory distress or aggravation of dyspnea already present prior to transfusion, the appearance or aggravation of pulmonary edema documented by clinical examination or imaging, as well as evidence of cardiovascular changes or of fluid overload. A high increase of BNP or of pro-BNP can help establish the diagnosis. The overload can be due to the rapid administration of fluids or the administration of fluids in excessive amounts. Thus, it is necessary to take into account all the fluids that were administered and not only the volume of LBPs.

The overload occurs most often in elderly patients and in those who have risk factors for heart failure or renal failure.

A.5.3.5.3 Acute post transfusion dyspnea

This reaction occurs during or within 24 hours of the end of the transfusion. It is characterized by respiratory distress for which the following transfusion reactions have been excluded as a cause of respiratory distress: TRALI and possible TRALI, TACO the overload and major allergic reaction. An underlying condition of the recipient as the cause of respiratory distress must also be excluded.

A.5.3.6 Physiological and metabolic complications

A.5.3.6.1 Transfusion related hypotension

This reaction usually occurs during transfusion, or shortly after the beginning of the transfusion, but it can also occur up to 4 hours following the end of transfusion. It is characterized in adults by a decrease of systolic or diastolic blood pressure (BP) ≥ 30 mmHg and systolic blood pressure (BP) ≤ 80 mmHg during transfusion. This reaction occurs more often in recipients taking angiotensin converting enzyme inhibitors (ACE). A sudden increase in bradykinin during transfusion could be involved in this reaction.

A.5.3.6.2 Transfusion associated graft versus host disease (TA-GVHD)

This syndrome appears 1 to 6 weeks after transfusion (generally within 7 to 10 days). The signs and symptoms are fever, diarrhea, and rash to the palms of the hands, soles of the feet and to the lobes of the ears. There is increased level of liver enzymes, hyperbilirubinemia and pancytopenia associated with bone marrow hypoplasia or aplasia.

The TA-GVHD reaction is severe (about 90% fatality) and may occur following the transfusion of any blood product containing T lymphocytes to an immunodeficient patient. This reaction can also occur during the transfusion of certain types of products like directed donation (when a close relative is the donor), compatible HLA platelets and granulocytes from a related donor. Universal leukoreduction of blood products has helped to reduce the risk of this reaction. However, the most effective preventative measure is to irradiate the blood products administered to recipients who may develop this reaction[1].

A.5.3.6.3 Post-transfusion purpura

Post-transfusion purpura (PTP) is a rare syndrome characterized by the sudden onset of severe thrombocytopenia, usually 5-10 days post-transfusion. This reaction may manifest itself with bleeding episodes (mucous membranes, gastrointestinal system, urinary tract, etc.) This reaction is caused by the presence of anti-platelet antibodies (anti-HPA).

A.5.3.6.4 Hypothermia

Hypothermia with the risk of cardiac arrhythmia, decreased cardiac output and hypotension may occur at the time of rapid and massive administration of cold LBPs or delivery of cold blood via a central catheter. Hypothermia

[1] NAC Annual Technical Report 2018 https://h5a9c8a9.stackpathcdn.com/media/2018-NAC-Annual-Report.pdf

may be accompanied by platelet dysfunction and coagulopathy. This complication can be prevented by using a blood warmer designed, approved for this purpose and used in compliance with the manufacturer's recommendations (to avoid hemolysis).

A.5.3.6.5 Citrate toxicity

Citrate, the anticoagulant used in blood products, chelates Ca^{++} and Mg^{++} ions and can induce hypocalcemia and hypomagnesemia in the recipient. The symptoms can range from tremors to cardiac arrhythmia and even cardiac arrest. An electrocardiogram (ECG) can help detect the effects of hypocalcemia.

The calcium reserves in the body are considerable and the citrate anticoagulant is normally metabolized quickly. However, citrate toxicity could manifest in a subject suffering from a serious liver disease who undergoes an exchange transfusion or rapid transfusion when the rate of transfusion is greater than one bag every five minutes. In the absence of underlying disease-causing hypocalcemia, most citrate reactions require no treatment other than slowing or stopping the transfusion.

A.5.3.6.6 Hyperkalemia

Potassium release in red blood cells increases with storage time and irradiation. Hyperkalemia can occur during massive and rapid transfusions. Newborns and infants are particularly at risk. Hyperkalemia can cause cardiac arrhythmias that may lead to cardiac arrest. Measures to reduce this risk should be considered for at-risk populations or risk situations, such as washing the red blood cells, removing the supernatant or using fresh blood.

A.5.3.6.7 Iron overload

There is a risk of iron overload for people who receive numerous red blood cell transfusions. Hemosiderosis may follow and require treatment with iron chelation.

A.6 Reporting serious adverse reactions

It is important to report all suspected serious adverse events as soon as they occur, in order to:

- recall other LBPs produced from the blood of the donors in question;
- conduct the necessary investigations and, when appropriate, apply suitable corrective measures to prevent or reduce such reactions;
- ensure that all persons involved are notified so that preventive and/or therapeutic measures may be taken as soon as possible.

Any serious adverse reaction potentially caused by the quality of a blood component must immediately be reported to Héma-Québec. Héma-Québec must report the serious adverse reaction to Health Canada within 15 days of receiving the initial report from the hospital blood bank.

The hospital blood bank must report a fatality to Héma-Québec within 24 hours if the initial investigation indicates that the fatality is attributable to the blood transfusion.

Héma-Québec must then report to Health Canada all fatalities related to the transfusion of a blood component within 24 hours following the notification by the hospital blood bank or the attending physician.

It is not necessary to report benign adverse reactions to Héma-Québec, such as febrile non-hemolytic reactions and minor allergic reactions, unless the attending physician feels that the nature of the reaction warrants investigation by Héma-Québec.

A.7 Traceback and lookback

A.7.1 Traceback

Héma-Québec will conduct a traceback on donors whose blood was given to a patient who tested positive post transfusion for one of the microorganisms listed in Table I.1 *Tests done on donor blood*.

Physicians must notify Héma-Québec as soon as possible of all infections diagnosed post transfusion if it is suspected that the infection was acquired through transfusion. Notification must be made as soon as possible. Héma-Québec must be notified even if there are other contamination risk factors for the patient in question.

To complete the traceback, Héma-Québec requires the list of blood products received by the infected person. For each transfusion, the hospital blood bank must provide the following information: type of LBPs, blood group, identification number and date of transfusion.

A.7.2 Lookback

When Héma-Québec is informed that a donor has tested positive for one of the microorganisms listed in Table I.1 *Tests done on donor blood*, it:

- notifies the donor of deferral from donation and of its duration;
- draws up a list of the deferred donor's previous donations;

– notifies the hospitals that received LBPs prepared from these donations;
– asks attending physicians to test their patients who were transfused with these products and to inform Héma-Québec of the results.

The notification coming from a treating physician or the Public Health must include the donor's name, gender, address, date of birth and donor number (if available) so that Héma Québec can investigate the donor's previous donations and inform hospital blood banks that received LBPs prepared from these donations.

Donors can be assured that the information sent to Héma-Québec will be kept strictly confidential. When communicating with hospital blood banks, Héma-Québec only provides the unit identification number of the LBPs being investigated.

II. LEUKOREDUCED ALLOGENIC LABILE BLOOD PRODUCTS

Only allogenic red blood cells and platelets are leukoreduced. These products respect the following standard: less than 5×10^6 leukocytes per unit.

Henceforth, to lighten the text, the term "leukoreduced" will be omitted.

A.8 General instruction for LBPs transfusion

1) Compatibility

All blood samples from LBP recipients must be analyzed according to current medical practices to verify recipient-donor compatibility according to LBPs required for transfusion.

– **Red blood cells** must be ABO compatible with recipient plasma ABO antibodies.
– The plasma in a platelet product being transfused should be ABO-compatible with the recipient's red blood cells.
– In the case of **plasma**, compatibility tests before transfusion are not necessary. However, the plasma must be ABO compatible with the recipient's red blood cells. Rh need not be considered when using this product.
– The transfusion service determines the transfusion policy regarding ABO compatibility of **cryoprecipitates**. The final label of the cryoprecipitate pools of different ABO groups must not mention the ABO group or be marked "indeterminate".
– Compatibility tests before transfusion of **cryosupernatants** are not necessary. However, the cryosupernatant must be ABO compatible with the recipient's red blood cells. Rh need not be considered when using this product.

See table *Labile blood products available from Héma-Québec* at the end of this notice.

2) Pre-transfusion verifications must be performed rigorously in accordance with the procedures in place at the hospital.

3) LBP containers must be intact. The packed red blood cells must have a uniform appearance.

4) LBPs must be transfused using a sterile, non-pyrogenic transfusion set equipped with a filter designed to trap aggregates (170-260 m in diameter).

5) **No medications or solutions containing calcium or glucose should be added to or infused through the same tubing with the LBPs.** Depending on hospital policy; a 0.9% Sodium Chloride Injection (USP), ABO-compatible plasma or 5% albumin may be used.

6) Hemolysis may become apparent during storage of LBPs containing red blood cells. LBPs must be carefully inspected for signs of hemolysis before administration.

7) Microbial growth may become apparent during storage of LBPs. LBPs must be carefully inspected before for microbial growth administration.

8) Upon visual inspection, if there is a doubt concerning the quality of an LBP (for example, hemolysis, presence of floccular material or a cloudy appearance), it should be returned to the hospital blood bank or Héma-Québec for further evaluation.

9) When thawing LBPs in a water bath, care must be taken to prevent contamination of the entry ports. The use of watertight protective plastic over-wraps is required. The presence of fibrin in a thawed product can be due to inadequate thawing at the time of product preparation.

10) If, for any reason, the pouch containing the LBPs is opened (in a closed circuit thus far), the LBPs expire 4 hours after opening if maintained at 20-24 °C, or 24 hours after opening if refrigerated at 1 to 6 °C. The new expiration date and time should appear on the newly generated label. Opening the container for any reason increases the risk of contamination and reduces the valid storage period.

11) Unless otherwise indicated by the patient's clinical condition, the rate of transfusion should be approximately 1 mL/kg/h for the first 15 minutes of the transfusion. The patient should be monitored during this period, since some life-threatening reactions may occur even after the transfusion of a small amount of blood (ex: immediate hemolytic reaction).

12) The transfusion should be completed within 4 hours of removing the unit from its controlled environment and should never exceed the LBP's expiration date and time. The expiration date is the last day LBPs may be used.

13) All serious transfusion-related adverse reactions must be reported to Héma-Québec as soon as possible (see Section A.6, *Reporting serious adverse reactions*).

A.9 DEHP

DEHP or bis (2-ethylhexyl) phthalate is a component of the plastic used in blood product bags and tubing allowing them to be flexible and malleable. However, DEHP dissolves gradually into the red blood cells during storage. DEHP integrates the red blood cell membrane resulting in prolonged storage. Although DEHP does not build up during storage of frozen LBPs, DEHP concentration increases in thawed plasma stored 5 days between 1 and 6 °C. It is also found in negligible quantity in platelets stored in bags manufactured with a plastic without DEHP. There is actually no scientific proof that DEHP, which is also part of the composition of a large number of medical devices, may represent a toxicity risk for patients exposed during a transfusion. A toxic effect on the development of the male reproductive system in rodents has been shown.

Recipient populations most at risk are the following: fetuses, newborns, and pre-pubescent boys who receive massive transfusions. Exposure to DEHP can be minimized by using the freshest possible blood. The World Health Organization considers DEHP to be a possible carcinogenic substance.

For the moment, alternative substances to DEHP for biomedical instruments are under investigation. Safety and biocompatibility levels for these new plastics are still to be confirmed.

A.10 Latex

All types of bags used at Héma-Québec are latex free except for pediatric red blood cells bags.

A.11 Anticoagulants

All anticoagulants used to collect LBPs at Héma-Québec are listed in the following table:

Table II.1

Summary of anticoagulants					
Anticoagulant solution	**Sodium citrate**	**Citric acid**	**Monobasic sodium phosphate**	**Dextrose**	**Adenine**
Citrate phosphate dextrose (CP2D) – 63 mL	26.3 g/L	3.27 g/L	2.22 g/L	51.1 g/L	N/A
CPD – 63mL	26.3 g/L	3.27 g/L	2.22 g/L	25.6 g/L	N/A
ACD-A	22.0 g/L	7.3 g/L	N/A	24.5 g/L	N/A
Sodium citrate	40 g/L	To adjust pH	N/A	N/A	N/A

A.12 Additives

All additives used in the preparation of LBPs at Héma-Québec are listed in the following table:

Table II.2

Summary of additives		
In water for injection (USP)	**AS-3 additive (100 mL)**	**SAGM additive (100 mL)**
Glucose	11 g/L	9 g/L
Adenine	0.3 g/L	0.169 g/L
Citric acid	0.42 g/L	N/A
Sodium citrate	5.88 g/L	N/A
Phosphate	2.76 g/L	N/A
Sodium chloride	4.1 g/L	8.77 g/L
Mannitol	N/A	5.25 g/L

A.13 Red blood cell characteristics

All characteristics of red blood cells prepared at Héma-Québec are listed in the following table:

Table II.3

Summary of Red Blood Cells characteristics				
QC data from 01-01-2022 to 31-12-2022*	**Hb mean (g/bag)**	**Ht mean (L/L)**	**Volume mean (mL)**	**RBC Volume mean (mL)**
RBC CP2D/AS-3 (n=2765)	56 ± 5	0.55 ± 0.05	304 ± 18	168 ± 20
RBC CPD/SAGM (n=341)	57 ± 5	0.58 ± 0.04	297 ± 17	174 ± 17
Washed RBC 7 day expiration (n=26)	56 ± 6	0.54 ± 0.05	305 ± 23	165 ± 24
Deglycerolyzed RBC 7 day expiration AS-3 (n=22)	49 ± 5	0.52 ± 0.04	323 ± 28	167 ± 19

*Mean value ± 1 Standard Deviation.

B. RED BLOOD CELLS

B.1 Description

a) AS-3 red blood cells from whole blood

AS-3 red blood cells are prepared from whole blood collected in a CP2D anticoagulant. A unit of red blood cells has a hemoglobin level superior or equal to 35 g/bag and a hematocrit level less or equal to 0.80 L/L.

This product contains red blood cells to which was added the AS-3 additive solution after extracting most of the plasma (the residual volume of plasma is evaluated to be 30± 7 mL).

b) SAGM red blood cells from whole blood

SAGM red blood cells are prepared from whole blood collected in a CPD anticoagulant. A typical unit of red blood cells has a hemoglobin level superior or equal to 35 g/bag, a hematocrit level less or equal to 0.80 L/L.

This product contains red blood cells to which was added the SAGM additive solution after extracting most of the plasma (the residual volume of plasma is evaluated to be 24 ± 4 mL.

B.2 Actions

These components improve the oxygen-carrying capacity of blood by increasing the circulating red blood cell mass.

B.3 Indications

Red blood cells are indicated for treating patients with a symptomatic deficit of oxygen-carrying capacity. It is also used for exchange transfusions.

B.4 Contraindications

Red blood cells must not be used when anemia can be treated with specific medications. Packed red blood cells are not indicated in the treatment of non-hemorrhagic hypovolemia.

B.5 Side effects and risks

The side effects and risks of transfusion of red blood cells are described in Section A.5, *Side effects and risks of LBP transfusions* and the table at the end of this notice *Number, Rates and Ratio of Transfusion Reactions based on the Type of Labile Blood Product Administered* reported to the Québec hemovigilance system in 2019.

Information concerning TA-GVHD and indications on the use of irradiated red blood cells can be found in Section A.5.3.6.2, *Transfusion associated graft-versus-host disease (TA-GVHD)*.

B.6 Dosage and administration

In an adult, one unit of blood will increase the recipient's hemoglobin level by approximately 10 g/L or the hematocrit level by 0.03 L/L to 0.04 L/L. The dosage depends on the patient's clinical condition, as well as his/her weight and height. For pediatric transfusion, the usual dosage is 15 mL/kg, and this increases the hemoglobin level by about 20 g/L.

Transfusion must be completed within 4 hours of removing the unit from its controlled environment.

If it is indicated to decrease the volume of LBPs transfused, the unit of blood can be centrifuged to remove all or part of the additive solution. This must be done immediately before transfusion. If it is indicated to decrease the additive solution content, it may be desirable to remove it through washing or centrifugation and removal of the supernatant and to resuspend the red blood cells in albumin, 0.9% sodium chloride injection (USP) or plasma to facilitate administration.

B.7 Storage

AS-3 or SAGM red blood cells collected in a hermetically-sealed container must be stored at a temperature between 1 and 6 °C. Under these conditions, the storage period of red blood cells is 42 days.

C. RED BLOOD CELLS, DEGLYCEROLIZED

C.1 Description

Red blood cells can be prepared for cryopreservation by adding glycerol as a protective agent.

Red blood cells frozen at –80 °C can be stored for up to 10 years. The storage period can be extended to more than 10 years with medical approval.

This product is deglycerolised by washing, using a known method. The hematocrit level is inferior or equal to 0.80 L/L. The hemoglobin level is superior or equal to 35 g/bag. In LBPs not leukoreduced before storage (prior to June 1999), virtually all the plasma, anticoagulant, residual platelets and leukocytes are removed during the washing procedure. Trace amounts of the cryoprotective agent may still be present in the product. The suspension medium used is an injectable solution of AS-3 serving as a preservative.

After thawing, the free hemoglobin in the supernatant from the last washing is no greater than 150 mg/dL. A light pink supernatant is acceptable for transfusion; however, if the supernatant appears dark red and/or cloudy, the unit should be returned to the blood bank or Héma-Québec for evaluation.

C.2 Actions

The function and post-transfusion survival rate of deglycerolized red blood cells are similar to AS-3/SAGM red blood cells.

C.3 Indications

Indications for transfusion of this product are the same as for AS-3/SAGM red blood cells. However, its use should be limited to special situations, including:

– individuals with rare blood types;

– individuals with an alloantibody to a high-incidence antigen;

– individuals with multiple alloantibodies.

A program for autologous donations destined for freezing LBPs may be necessary in the cases mentioned above.

C.4 Contraindications

Contraindications are the same as for AS-3/SAGM red blood cells.

C.5 Side effects and risks

Side effects are similar to those for red blood cells, except for the reduced risk of febrile non hemolytic reactions and allergic reactions.

There is a greater risk of bacterial contamination for deglycerolized products prepared with an open system process, resulting in 24 hours expiry after thawing.

C.6 Dosage and administration

Dosage and administration are the same as for AS-3/SAGM red blood cells.

Transfusion must be completed within 4 hours of removing the unit from its controlled environment.

C.7 Storage

When stored between 1 and 6 °C, deglycerolized red blood cells must be administered within 24 hours or 7 days, depending on the freezing procedure used, and must be transfused before the expiration date and time indicated on the label.

D. WASHED RED BLOOD CELLS

D.1 Description

Red blood cells are washed to reduce considerably the quantity of various plasma proteins and other substances that may cause adverse reactions. This product contains more than 75% of the red blood cells from the original product. Almost all other substances (anticoagulant, platelets, leukocytes and potassium) are removed during the washing procedure.

Héma-Québec uses a closed-circuit washing method, and the suspension medium is an injectable solution of AS-3 (an additive serving as a preservative).

D.2 Actions

The function and post-transfusion survival rate of washed red blood cells are similar to AS 3/SAGM red blood cells.

D.3 Indications

The indication applies to patients who have had major allergic reactions to other plasma proteins. Washed red blood cells are indicated for patients who are IgA-deficient where anti-IgA antibodies are present and who have had major allergic reactions following the transfusion of LBPs.

D.4 Contraindications

The contraindications are the same as for AS-3/SAGM red blood cells.

D.5 Side effects and risks

The side effects are the same as for AS-3/SAGM red blood cells except for the reduced risk of febrile non hemolytic reactions and allergic reactions.

D.6 Dosage and administration

Dosage and administration are the same as for AS-3/SAGM red blood cells.

The transfusion must be completed within 4 hours of removing the unit from its controlled environment.

D.7 Storage

Washed RBCs within a closed system procedure have an expiration date of 7 days AS-3 when stored between 1 and 6 °C, except when irradiated: see product label.

E. RED BLOOD CELLS, PEDIATRIC PACKS (NON DIVIDED)

E.1 Description

Using a sterile connection, a container with four satellite bags is attached to the AS-3/SAGM red blood cell bag by Héma-Québec, allowing the hospital to divide the product as required, thus using the whole product while minimizing losses.

E.2 Actions

The function and post-transfusion survival rate of red blood cells in pediatric packs are similar to those of AS-3/SAGM red blood cells.

E.3 Indications

For neonates requiring small volume transfusions, pediatric packs can be used for more than one neonate and also for people of small stature.

E.4 Contraindications

Contraindications are the same as for AS-3/SAGM red blood cells.

E.5 Side effects and risks

Side effects and risks are the same as for AS-3/SAGM red blood cells.

E.6 Dosage and administration

Dosage and administration of pediatric packs are essentially the same as for AS-3/SAGM red blood cells.

E.7 Storage

Pediatric packs have the same expiration date as AS-3/SAGM red blood cells.

F. PLATELETS

F.1 Pooled platelets

F.1.1 Description

Pooled platelets are prepared from whole blood collected in a CPD anticoagulant solution. Pooling is performed within five intermediate platelets leukoreduced to reduce the number of leukocytes. Each final unit contains at least 2.4×10^{11} platelets suspended in plasma from all 5 of the intermediate platelets, with an average of $3.9 \pm 0.5 \times 10^{11}$ platelets/pool.

Pooled platelets may contain trace amounts of residual red blood cells (rRBCs).

The quantity of rRBCs in intermediate platelets is an average of $6.6 \pm 1.8 \times 10^{8}$ rRBCs/unit or an equivalent of 40 ± 20 µL/unit (maximum 87 µL/unit)*.

*The quantity of rRBCs for pooled platelets is an overall average of the data obtained for all preparation programs during the validation of the SAGM red blood cell preparation process. The colour of the unit of pooled platelets is yellowish but may vary from pink to reddish. Pooled platelets contain less than 5×10^{6} leukocytes per unit. Moreover, each unit of pooled platelets is cultured for bacterial contamination. See Section A.3, *Testing of donor blood*.

F.1.2 Actions

The primary role of platelets is to participate in blood coagulation by forming an aggregate that blocks injured blood vessel walls to treat or prevent any bleeding.

F.1.3 Indications

Transfusion of pooled platelets to patients with thrombocytopenia and hemorrhaging can control the bleeding and increase platelet count (prophylactic transfusion).

F.1.4 Contraindications

Platelets are generally contraindicated in patients with thrombotic thrombocytopenic purpura (TTP) or suffering from immune thrombocytopenic purpura (ITP) unless the patient has a life-threatening hemorrhage.

F.1.5 Side effects and risks

Refer to Section A.5, *Side effects and risks of transfusion of LBP* and to the table at the end of this notice *Number, Rates and Ratio of Transfusion Reactions and Errors based on the Type of Labile Blood Product Administered* reported to the Québec hemovigilance system in 2019.

Platelets carry a variety of antigens, including HLA and HPA. When transfused to a patient with a specific antibody for an expressed antigen, the survival time of the transfused platelets may be markedLy shortened. If alloimmune platelet refractoriness is documented, HLA or HPA platelets obtained by apheresis are indicated.

Immunization to red blood cell antigens rarely occurs because of the presence of trace amounts of red blood cells in the platelet unit (see F.1.1 for quantity). When the platelets from Rh-positive donors are transfused to an Rh-negative female of childbearing age, prevention of antigen D immunization by use of anti-D immunoglobulin should be considered. In the presence of ABO incompatibility, a direct antiglobulin test may be positive with or without hemolysis.

F.1.6 Dosage and administration

The number of units of pooled platelets to be administered depends on the clinical situation of each patient. One unit of pooled platelets should increase the platelet count of a 70 kg adult by 30 to 60 x 10^9/L (30 000 to 60 000 /µL) when measured 20-60 minutes post transfusion in a patient not known for a platelet refractory state.

Because of the short life span of the transfused platelets, the dose may need to be repeated. For pediatric needs, it is possible to attach a container with four satellite bags to a unit of pooled platelets using a sterile connection allowing the hospital to divide the volume as required. A residual volume of 100 mL in the mother bag is required to maintain adequate storage.

The transfusion rate of pooled platelets must be adjusted to the clinical condition of the recipient, but the transfusion should not last more than 4 hours.

F.1.7 Storage

Pooled platelets may be stored for up to 7 days, as indicated on the label.

Pooled platelets must be stored between 20 to 24°C and agitated gently and continuously during storage.

F.2 Apheresis platelets

F.2.1 Description

Apheresis is an effective way to harvest a therapeutic dose of platelets sufficient for an adult from one individual donor. A typical unit of apheresis platelets collected into ACD-A contains at least 2.4 x 10^{11} platelets.

After leukocyte depletion by centrifugation (integrated in the collection process), the product contains less than 5 x 10^6 residual leukocytes. Trace amounts of residual red blood cells may also be present (approximately 3 ± 2 µL). Moreover, each unit of platelets is cultured for bacterial contamination. See Section A.5.1.2, *Bacterial contamination*.

F.2.2 Actions

The main role of platelets is to participate in blood clotting by forming an aggregate that seals the injured vascular wall in order to treat or prevent bleeding.

F.2.3 Indications

Transfusion of platelets to patients with thrombocytopenia and hemorrhaging can control the bleeding and increase platelet count (prophylactic transfusion).

If required because of anti-HLA or anti-HPA alloimmunization, a sample can be obtained from an HLA or HPA donor compatible with the recipient.

F.2.4 Contraindications

Platelets are generally contraindicated in patients with thrombotic thrombocytopenic purpura (TTP) or suffering from immune thrombocytopenic purpura (ITP) unless the patient has a life-threatening hemorrhage.

F.2.5 Side effects and risks

See Section A.5, *Side effects and risks of LBP transfusions* and the table at the end of this notice *Number, Rates and Ratio of Transfusion Reactions and Errors based on the Type of Labile Blood Product Administered* reported to the Québec hemovigilance system in 2019.

The administration of type O apheresis platelets to a type A, B or AB recipient may be suitable as long as the hemolysins anti-A / anti-B titer is not considered high, meaning inferior to 1/128 (H.T.N.D.).

Note : T.E.N.D / H.T.N.D indicates Titre élevé non détecté / High Titer Not Detected.

Without this information, it is best to avoid the transfusion of non isogroup type O apheresis platelets especially for children, so that the risk of hemolysis is lower for the recipient.

F.2.6 Dosage and administration

The number of apheresis platelet bags to be administered depends on the condition of each recipient. A bag administered to a 70 kg adult should increase platelet count by 30 to 60 x 10^9/L (from 30,000 to 60,000 /µl) when a platelet count is taken 20 to 60 minutes after transfusion in a patient not known for a platelet refractory state.

Due to the short life span of transfused platelets, it is sometimes necessary to repeat the dose. For pediatric needs, it is possible to connect to a device of four satellite bags to the main bag allowing the hospital to distribute the required volume. A residual amount of 100 mL is required in the mother bag to maintain adequate storage.

The transfusion rate of platelets must be adjusted to the clinical condition of the recipient, but the transfusion should not last more than 4 hours.

F.2.7 Storage

Apheresis platelets may be stored for up to 7 days when stored between 20 to 24 °C.

Apheresis platelets must be gently and continuously agitated during storage.

G. GRANULOCYTES

G.1 Description

A preparation of granulocytes can be obtained by apheresis from a single donor. The donor is stimulated with a corticosteroid*. The goal is to obtain a quantity of at least 1 x 10^{10} granulocytes. The unit contains on average 32 ± 8 mL (24-40 mL) of red blood cells and a variable number of lymphocytes and platelets in plasma.

Hydroxyethyl starch 6% is used to facilitate the collection of granulocytes. A solution of 46.7% sodium citrate diluted in 500 mL hydroxyethyl starch 6% is used to collect granulocytes. Approximately 36 mL of hydroxyethyl starch 6% and 2 mL of sodium citrate 46.7% can be found in the final product.

*Corticosteroid and Hespan hydroxyethyl starch 6% are not approved for this use in Canada.

G.2 Actions

Granulocytes phagocytize bacteria and fungi.

A transfusion of granulocytes in itself is rarely associated with an increase in granulocytes in the patient. This may be attributable to the consumption of granulocytes at the infectious process site.

G.3 Indications

Granulocytes are primarily indicated as a supportive therapy in patients with significant neutropenia (generally less than 0.5 x 10^9/L) and severe, documented bacterial or fungal infection not responding to antimicrobials or antifungals. The efficacy of granulocyte transfusions in various clinical settings has not been proven. This product is not recommendedfor the prophylactic treatment of infection.

Granulocytes for CMV-seronegative recipients should be collected from CMV-seronegative donors.

To prevent transfusion associated graft versus host disease (TA-GVHD) granulocytes must be irradiated.

G.4 Contraindications

Recipients with anti-HLA or anti-neutrophil antibodies may not fully benefit from granulocyte transfusion and may have a higher risk of complications.

G.5 Side effects and risks

See Section A.5, *Side effects and risks of LBP transfusions* and the table at the end of this notice *Number, Rates and Ratio of Transfusion Reactions and Errors based on the Type of Labile Blood Product Administered* reported to the Québec hemovigilance system in 2019.

The transfusion of granulocytes can cause chills, fever and pulmonary insufficiency.

The amount of hydroxyethyl starch 6% in the product can cause side effects. Allergic reactions in particular are possible.

G.6 Dosage and administration

Granulocytes contain a large number of red blood cells, and bidirectional compatibility tests (major and minor) must be conducted.

Granulocytes should be administered as soon as possible after collection using a standard transfusion set. Leukocyte depletion filters trap granulocytes and must not be used in the transfusion of this component.

G.7 Storage

The product may be stored between 20 to 24 °C for no longer than 24 hours **without agitation**.

H. FROZEN PLASMA

H.1 Description

Frozen plasma :

a) is prepared from whole blood collected in a closed system in CP2D or CPD;

b) is harvested by apheresis in a closed system in ACD-A.

Plasma is frozen at –18°C or colder within 24 hours of collection. These products contain proteins, including albumin and coagulation factors.

H.2 Actions

Plasma is administered to patients to correct a qualitative or quantitative coagulation factor deficiency.

H.3 Indications

Several coagulation factor concentrates are commercially available and should be preferentially used instead of frozen plasma due to their speed of action and their reduced risk of infection and TACO.

The use of frozen plasma is indicated for the following conditions:

a) massive transfusion;

b) patient who is bleeding or must undergo surgery if the clotting factor concentrates or other treatments are not available (e.g., liver failure);

c) diffuse microvascular bleeding (e.g., disseminated intravascular coagulation – DIC);

d) thrombotic thrombocytopenic purpura (TTP).

H.4 Contraindications

Frozen plasma is not indicated to correct coagulation factor deficiencies when specific coagulation factor concentrates are commercially available. Also, if there is sufficient time, frozen plasma must not be used if the coagulopathy can be corrected more effectively with a specific treatment, such as vitamin K. For urgent warfarin reversal, it is preferable to use prothrombin complex concentrates.

H.5 Side effects and risks

See Section A.5, *Side effects and risks of LBP transfusions* and the *Number, Rates and Ratio of Transfusion Reactions and Errors based on the Type of Labile Blood Product Administered* reported to the Québec hemovigilance system in 2019.

Note however, that CMV and HTLV I/II are not transmissible by the transfusion of plasma products.

H.6 Dosage and administration

The transfused volume depends on the patient's clinical picture and weight and may be determined according to laboratory coagulation test results.

Frozen plasma is thawed in a water bath or any other device licensed for this use. Transfusion ports must be protected from water by placing the plasma bag in a watertight protective plastic over-wrap. To avoid undue modification of the water bath temperature resulting in extended thawing time, the number of frozen plasma units to be thawed at the same time should be limited.

Do not use if the container is damaged or if the product has thawed during storage.

H.7 Storage

Frozen plasma may be stored for 12 months at -18 °C or colder. When thawed, it can be stored:

a) between 1 and 6 °C for 5 days before transfusion; or

b) 24 hours if the circuit was open.

It must not be refrozen.

I. CRYOPRECIPITATE

I.1 Description

Cryoprecipitate is prepared by thawing frozen plasma (collected into CP2D) at a temperature between 1 and 6 °C and recovering the insoluble precipitate, which is then refrozen. Each unit of cryoprecipitate contains on average 461±153 mg/pouch of fibrinogen, factor VIII, factor XIII and Von Willebrand factor.

I.2 Actions

Cryoprecipitate is mostly used as a source of fibrinogen and Factor XIII.

I.3 Indications

In cases of massive hemorrhage, cryoprecipitate can be used to compensate for fibrinogen loss. For isolated coagulation factor deficiencies, if commercial concentrates are not available, this component can be used to treat:

a) factor XIII deficiencies;

b) congenital hypofibrinogenemia or dysfibrinogenemia.

I.4 Contraindications

Cryoprecipitate should not be used to make fibrin glue. Commercial fibrin glue should be used for this purpose.

I.5 Side effects and risks

See Section A.5, *Side effects and risks of LBP transfusions* and the table at the end of the notice *Number, Rates and Ratio of Transfusion Reactions and Errors based on the Type of Labile Blood Product Administered* reported to the Québec hemovigilance system in 2019.

Note, however, that CMV and HTLV I/II are not transmissible by the transfusion of plasma products.

I.6 Dosage and administration

The product is thawed in a water bath or any other device licensed for this use. Cryoprecipitate units must be inserted in a watertight protective plastic over-wrap and gently shaken. To avoid undue modification of the water bath temperature resulting in extended thawing time, the number of cryoprecipitate units to be thawed at the same time should be limited. Do not use if the container is damaged or if the product has thawed during storage. Do not refreeze after thawing.

A policy shall be in place concerning ABO compatibility of cryoprecipitate components. All recipients may be transfused with any ABO group of cryoprecipitate.

Pooling

Units from different ABO groups can be pooled together. A volume of 10-15 mL of NaCl 0.9% (USP) is added to reconstitute the pool.

The required dose of fibrinogen is calculated using the following formula:

1) Patient's weight (kg) x 70 mL/kg = blood volume (mL);

2) Blood volume (mL) x (1.0 – hematocrit) = plasma volume (mL);

3) Quantity of fibrinogen required in mg = (Desired fibrinogen level in mg/dL – initial fibrinogen level in mg/dL) x plasma volume (mL) ÷ 100 mL/dL

4) Number of units of cryoprecipitate required = mg of required fibrinogen ÷ 500 mg of fibrinogen/unit of cryoprecipitate.

I.7 Storage

Cryoprecipitate may be stored for 12 months at –18°C or colder.

Cryoprecipitate must be transfused within 24 hours of thawing. It must be stored between 20-24°C while waiting to be administered.

Open system

Cryoprecipitate must be transfused within 4 hours after pooling in an open system.

J. CRYOSUPERNATANT

J.1 Description

This product is prepared from whole blood collected into a CP2D anticoagulant solution.

Cryosupernatant is prepared by thawing frozen plasma between 1 and 6 °C and recovering the residual plasma following the preparation of cryoprecipitate. This product is then refrozen.

Cryosupernatant contains proteins, such as albumin and factors II, V, VII, IX, X and XI.

J.2 Actions

Cryosupernatant is a source of plasma proteins, with the exception of fibrinogen, von Willebrand factor and factors VIII and XIII.

J.3 Indications

This product is primarily used in some patients with thrombotic thrombocytopenic purpura (TTP), or in cases of atypical hemolytic uremic syndrome (aHUS) as part of plasma exchange therapy.

J.4 Contraindications

This product is not indicated for labile coagulation factor deficiencies or the replacement of a patient's plasma volume.

J.5 Side effects and risks

See Section A.5, *Side effects and risks of LBP transfusions* and the table at the end of this notice *Number, Rates and Ratio of Transfusion Reactions and Errors based on the Type of Labile Blood Product Administered* reported to the Québec hemovigilance system in 2019.

Note, however, that CMV and HTLV I/II are not transmissible by the transfusion of plasma products.

J.6 Dosage and administration

The transfused volume depends on the patient's clinical picture and weight.

Do not use the product if the container is damaged or if the product has thawed during storage. Cryosupernatant must be thawed in a water bath or any other device licensed for this use. Transfusion ports must be protected from water by placing the cryosupernatant bag in a watertight protective plastic over-wrap using gentle agitation. To avoid undue modification of the water bath temperature resulting in extended thawing time, the number of cryosupernatant units to be thawed at the same time should be limited.

J.7 Storage

Cryosupernatant may be stored for 12 months at –18 °C or colder.

Cryosupernantant can be stored up to 5 days between 1 and 6 °C or must be transfused within 24 hours of thawing.

Open system

If the system has been opened at any time since collection, the cryosupernatant:

- must be transfused within 4 hours of thawing; or,
- stored 24 hours between 1 and 6 °C after thawing.

Do not refreeze.

III. AUTOLOGOUS RED BLOOD CELLS PRODUCTS

Autologous red blood cells are required in cases where the recipient has a rare blood type with multiple antibodies and/or alloantibodies targeting high-incidence antigens and where the donor is ineligible for an allogeneic donation. Except for donor selection criteria, autologous labile blood products (LBPs) in CP2D are IDENTICAL to allogenic LBPs with respect to their description, actions, contraindications, dosage, administration and storage. Héma-Québec favours the allogeneic donation process, even for autologous donation requests, if time allows and if the patient is eligible based on the qualification criteria for allogeneic donation. In cases of rare blood, if the allogeneic donation is not transfused fresh, it will be cryopreserved and stored in the rare blood bank to meet the needs of all patients with this type of blood.

BIBLIOGRAPHY

Blood Transfusion Therapy: A Physician's Handbook, AABB, 13th edition 2017, Edited by Nick Bandarenko, MD, and Karen King, MD.

Canadian Blood Services; *Circular of information For the Use of Human Blood Components, Plasma Components*, Last Updated January 2021, Plasma Components - Circular of Information - 1000104990 (blood.ca)

Callum JL., Lin Y., Pinkerton PH., Karkouti K., Pendergrast JM, Robitaille N, Tinmouth AT. and Webert, KE Bloody Easy 4th ed. Toronto (Ontario): Sunnybrook and Women's College Health Sciences Centre, 2016.

Clinical Practice of Transfusion Medicine / Petz LD, Swisher S.N. (editors), 3rd ed., New York: Churchill-Livingston, 1995.

Guide de déclaration des réactions indésirables associés à la transfusion de produits sanguins, January 1, 2023.

Mollison's Blood Transfusion in Clinical Medicine, Oxford: Blackwell Scientific Publications

Pediatric transfusion a Physician's Handbook, ed. AABB 3rd ed. AABB

Standards for Blood Banks and Transfusion Services, 33rd ed. AABB, Bethesda, April 1, 2022.

Technical Manual, 20th edition AABB, Bethesda, 2020, Edited by Mark K. Fung, MD, PhD; Anne F. Eder, MD, PhD; Steven L. Spitalnik, MD; and Connie M. Westhoff, PhD, MT(ASCP)SBB

Transfusion reaction, 5th edition, AABB, Bethesda, 2021.

Bowden, R.A., Slichter, S.J., Sayers, M. [& al.]. *A comparison of filtered leukocyte-reduced and cytomegalovirus (CMV) seronegative blood products for the prevention of transfusion-associated CMV infection after marrow transplant*. Blood 1995; 86 (9) 3598-3603.

Carson JL, Guyatt G, HeddLe NM,et al. *Clinical Practice Guidelines From the AABB: Red Blood Cell*

Transfusion Thresholds and Storage. JAMA. 2016 Nov 15;316(19):2025-2035.

Institut national de santé publique du Québec, Comité d'hémovigilance du Québec – *2019 INSPQ Report*/Ministère de la Santé et des Services Sociaux *Surveillance des erreurs et réactions transfusionnelles au Québec* (inspq.qc.ca)

Delage G, Goldman M, HeddLe N, McCombie N, Robillard P, for the Public Health Agency of Canada. *Guideline for investigation of suspected transfusion transmitted bacterial contamination*. CCDR 2008;34S1:1-8

Dunstan RA, et al. *Emerging viral threats to the Australian blood supply*, Aust N Z J Public Health. Vol. 32 no. 4, 2008. https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1753-6405.2008.00254.x

Grégoire, Y., Delage G. et Germain M.; *Risques de transmission des infections virales par la transfusion attribuables à la période muette - Estimés applicables à la réserve de sang du Québec* /; Héma-Québec, 2018.

Kaufman RM, Djulbegovic B, Gernsheimer T et al. AABB. *Platelet transfusion: a clinical practice guideline from the AABB*. Ann Intern Med. 2015 Feb 3;162(3):205-13.

Guidance Document: Blood Regulations, Health Products and Food Branch, Health Canada, Modified Date 2016-03-08.

Guideline for Investigation of Suspected Transfusion Transmitted Bacterial Contamination, CCDR ISSN 1188-4169, volume : 34S1, January 2008.

Thibault L et al, *Establishment of an immunoglobulin A–deficient blood donor registry with a simple in-house screening enzyme-linked immunosorbent assay*, Transfusion vol 46, December 2006.

M. Delaney,D. Mayock, A. Knezevic, C. Norby-Slycord,E. Kleine, R Patel, K. Easley and C. Josephson. *Postnatal cytomegalovirus infection: a pilot comparative effectiveness study of transfusion safety using leukoreduced-only transfusion strategy*, Transfusion vol. 56 issue August 8, 2016.

NAC statement regarding appropriateness of use of Cytomegalovirus (CMV) sero negative versus CMV safe product (February 14, 2017) https://www.nacblood.ca/resources/guidelines/CMV.htmL

New England Journal of Medicine: Research & Review *A Comparison of Albumin and Saline for Fluid Resuscitation in the Intensive Care Unit* The SAFE Study Investigators, May 27, 2004, N Engl J Med 2004; 350:2247-2256 DOI: 10.1056/NEJMoa040232. https://www.nejm.org/doi/full/10.1056/NEJMoa040232

CAN/CSA-Z902-20 *Blood and blood components*, March 2020.

Laura Tonnetti, Sheila F. O'Brien, Yves Grégoire, Melanie C. Proctor, Steven J. Drews, Gilles Delage, Margaret A. Fearon, Vanessa Brès, Jeffrey M. Linnen, and Susan L. Stramer *Prevalence of Babesia in Canadian blood donors*: June–October 2018 Transfusion 2019 ;59;3171–3176.

Phthalates Regulations, Canada Consumer Product Safety Act; SOR/2010-298. Canada, 2011.

Robitaille, N; *Recommandations sur l'utilisation de produits cellulaires séronégatifs au cytomégalovirus (CMV)*, Direction de la biovigilance et de la biologie médicale, approuvé CCNMT. Québec, July 2015.

Robillard P, Delage G, Nawej KI, Goldman M. *Use of hemovigilance data to evaluate the effectiveness of diversion and bacterial detection*. Transfusion 2011; 51:1405-1411. Reference NHSBT 2017 Mcdonnal

Sampson J, De Korte D. *DEHP-plasticised PVC: relevance to blood services*. Transfusion medicine 2011; 21; 73-83.

Schwartz J, Padmanabhan A, Aqui N, Balogun RA, Connelly-Smith L, Delaney M, Dunbar NM, Witt V, Wu Y, Shaz BH. *Guidelines on the Use of Therapeutic Apheresis in Clinical Practice-Evidence-Based Approach from the Writing Committee of the American Society for Apheresis*: *The Seventh Special Issue.* J Clin Apher. 2016 Jun;31(3):149-62. doi: 10.1002/jca.21470. Review. PubMed PMID: 27322218.

SandLer SG(1), Eder AF, Goldman M, Winters JL. *The entity of immunoglobulin A-related anaphylactic transfusion reactions is not evidence based,* Transfusion 2015 Jan;55(1):199-204. doi: 10.1111/trf.12796. Epub 2014 Jul 28.

Standards for Hospital Transfusion Services/ Canadian Society for Transfusion Medecine, version 5, December 2021.

van der Meer PF, Reesink HW, Panzer S, Wong J, Ismay S, Keller A, Pink J, Buchta C, Compernolle V, Wendel S, Biagini S, Scuracchio P, Thibault L, Germain M, Georgsen J, Begue S, Dernis D, Raspollini E, Villa S, Rebulla P, Takanashi M, de Korte D, Lozano M, Cid J, Gulliksson H, Cardigan R, Tooke C, Fung MK, Luban NL, Vassallo R, Benjamin R. *Should DEHP be eliminated in blood bags?* Vox Sang 2014;106: 176-95.

Santé Canada : *Évaluation de la mesure de la performance pour la gestion des risques du phtalate de bis(2-éthylhexyle) (DEHP) – volet santé.*

GLOSSARY

Ab	Antibody
Additive solution	Nutritive solution (AS-3 and SAGM)
Ag	Antigen
Adverse reaction	Negative reaction to the transfusion of a safe blood product. Defined as a harmful, non-intentional reaction following the transfusion of blood or a blood component, regardLess of whether it is considered to be due to the transfusion or an error or accident. Adverse reactions to products derived from human plasma are treated in the same manner as adverse reactions to drugs and are subject to the applicable sections of the Food and Drug Regulations.
aHUS	Atypical Hemolytic Uremic Syndrome
ALI	Acute Lung Injury
APTT	Activated Partial Thromboplastin Time
B19	Parvovirus B19
BNP	B-type natriuretic peptide
Serious adverse reaction	Adverse reaction that results in any of the following consequences for the donor or the recipient: a) hospital stay or the extension of a hospital stay; b) significant or persistent disabilitythe; c) necessity of medical intervention or surgery to prevent such disability; d) an ailment that may be life threatening; e) death.
Unexpected adverse reaction	This reaction is not mentioned as one of the possible adverse reactions described in this document or reported by the recipient. Its nature and severity or consequences do not correspond to the information provided in this document or in any other document provided to the recipient.
Chagas disease	Parasite infection caused by Trypanosoma cruzi
Closed circuit	Blood collection system meant to collect or process blood products. The different components are assembled by a supplier and are then sterilized to reduce to a minimum the risk of external bacterial or viral contamination following collection.
CMV	Cytomegalovirus
DIC	Disseminated Intravascular Coagulation
HAV	Hepatitis A Virus
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HHV-8	Human Herpes Virus type 8
HIV 1/2 p24	Human Immunodeficiency Virus type 1 and 2 and p24 antigen
HLA	Human Leukocyte Antigen
HPgV-1	Human Pegivirus type 1
HTLV I/II	Human T-cell lymphotropic virus type 1 and 2
IgA	Immunoglobulin A
INR	International Normalized Ratio
ISBT	International Society of Blood Transfusion
ITP	Immune Thrombocytopenic Purpura
LBPs	Labile blood products
LDH	Lactate dehydrogenase
Massive transfusion	Is defined as the replacement, within a 24-hour period, of a volume of blood equal or superior to the recipient's total blood volume.
NAT	Nucleic Acid Test
Open circuit	Blood collection or processing system for which the integrity is affected. The sterility seal is broken during any step of blood processing. The circuit is considered open from the moment the break occurred.
PT	Prothrombin Time
PTT	Thrombotic Thrombocytopenic Purpura
T.E.N.D / H.T.N.D.	Titre élevé non détecté / High Titer Not Detected
TACO	Transfusion-associated circulatory overload
TRALI	Transfusion-Related Acute Respiratory Syndrome
WNV	West Nile Virus

LABILE BLOOD PRODUCTS (LPB) AVAILABLE FROM HÉMA-QUÉBEC

Allogenic LBPs	Major indications	Actions	Contraindications	Special precautions	Risks	Rate of infusion
Red blood cells, partially leukoreduced	Symptomatic oxygen transport deficiencies in anemic patients. It is used during exchange transfusions	Restoration of oxygen-carrying capacity	Pharmacologically treatable anemia	Must be ABO compatible	Febrile reactions, allergic reactions, TACO, hemolytic reactions, TRALI, bacterial contamination, others reactions and infectious diseases	According to patient's tolerance, but less than 4 hours
Red blood cells, deglycerolized	Same as for leukoreduced red blood cells. Patients with rare blood type, numerous alloantibodies or directed against high incidence antigen	Restoration of oxygen-carrying capacity	Pharmacologically treatable anemia	Must be ABO compatible	Febrile reactions, allergic reactions, TACO, hemolytic reactions, TRALI, bacterial contamination, other reactions and infectious diseases	According to patient's tolerance, but less than 4 hours
Washed red blood cells, leukoreduced	Same as for leukoreduced red blood cells. Patient with IgA deficiency and anti-IgA antibodies present, and having already presented with a major allergic reaction to plasma proteins	Restoration of oxygen-carrying capacity	Pharmacologically treatable anemia	Must be ABO compatible	Febrile reactions, allergic reactions, TACO, hemolytic reactions, TRALI, bacterial contamination, other reactions and infectious diseases	According to patient's tolerance, but less than 4 hours

PUB-00038[2] • Effective date: October 2023

LABILE BLOOD PRODUCTS (LPB) AVAILABLE FROM HÉMA-QUÉBEC (CONT'D)

Allogenic LBPs	Major indications	Actions	Contraindications	Special precautions	Risks	Rate of infusion
Leukoreduced pooled platelets and leukoreduced platelets by apheresis	Hemorrhage from thrombocytopenia or platelet function abnormality, hemorrhagic manifestations (prophylactic transfusion)	Improvement of hemostasis to treat or prevent hemorrhage	Hemorrhage from plasma coagulation factor deficits and some conditions with rapid platelet destruction (e.g. ITP and PTT)	ABO-compatible preferred. For apheresis platelets, , possible substitution by a group O product, if H.T.N.D less than 1/128	Febrile reactions, allergic reactions, TACO, hemolytic reactions, TRALI, bacterial contamination and Infectious diseases	As patient can tolerate, but less than 4 hours
Granulocytes	Serious neutropenia. Adjuvant to antimicrobial or antifungal treatments in severe bacterial or fungal infections that do not respond adequately to undergoing treatments	Phagocytize and kill bacteria and fungi	Patients with anti-HLA or anti-neutrophil antibodies might not fully benefit from a granulocyte transfusion and may present a higher risk of complications	All recipients may be transfused with any ABO group of cryoprecipitate. Units from different ABO groups can be pooled together. The transfused volume depends on the clinical picture and weight of the patient.	The transfusion of granulocytes can cause shivers, fever and possible pulmonary complications. The quantity of Hespan 6% in the product can cause side effects. Allergic reactions are possible	As patient can tolerate, but less than 4 hours

LABILE BLOOD PRODUCTS (LPB) AVAILABLE FROM HÉMA-QUÉBEC (CONT'D)

Allogenic LBPs	Major indications	Actions	Contraindications	Special precautions	Risks	Rate of infusion
Frozen plasma	Qualitative or quantitative coagulation factor deficits. Massive transfusions. Hemorrhage diffuse microvascular bleeding. Thrombotic thrombocytopenic purpura	Source of coagulation factors	Plasma is not indicated for coagulation factor deficits when a commercial coagulation factor concentrate is available. Coagulopathy is best treated with a specific treatment (vitamin K administration). Volume replacement	Must be ABO compatible but, compatibility tests before transfusion are not necessary. The transfused volume depends on the clinical picture and weight of the patient	Febrile reactions, allergic reactions, TACO, TRALI, Bacterial contamination, and Infectious diseases	As patient can tolerate, but less than 4 hours
Cryoprecipitate	Massive hemorrhage to compensate for the loss of fibrinogen. Factor XIII deficits. Congenital hypofibrinogenemia or dysfibrinogenemia	Used mostly as a source of fibrinogen. It also contains factor VIII, factor XIII and Von Willebrand factor	Commercially available specific coagulation factor concentrates. Should not be used to make fibrin glue. Commercial fibrin glue should be used.	All recipients may be transfused with any ABO group of cryoprecipitate. Units from different ABO groups can be pooled together. The transfused volume depends on the clinical picture and weight of the patient	Febrile reactions, allergic reactions, TACO, hemolytic reactions, TRALI, bacterial contamination, and Infectious diseases	As patient can tolerate, but less than 4 hours

PUB-00038[2] • Effective date: October 2023

LABILE BLOOD PRODUCTS (LPB) AVAILABLE FROM HÉMA-QUÉBEC (CONT'D)

PSL allogéniques	Principales Indications	Action	Contre-indications	Précautions spéciales	Risques	Débit de la transfusion
Cryosupernatant	Thrombotic thrombocytopenic purpura, atypical hemolytic uremic syndrome during plasma exchange therapy	Source of plasma proteins except for fibrinogen, Von Willebrand factor, factor VIII and factor XIII	It is not indicated for treating deficits of labile coagulation factors or for plasma volume replacement	Must be ABO-compatible but, compatibility tests before transfusion are not necessary. The transfused volume depends on the clinical picture and weight of the patient	Febrile reactions, allergic reactions, TACO, TRALI, hemolytic reactions, bacterial contamination, and Infectious diseases	As patient can tolerate, but less than 4 hours

MEAN VOLUMES OF ALLOGENIC LABILE BLOOD PRODUCTS AVAILABLE FROM HÉMA-QUÉBEC

Product	Mean volume (mL) ± 1 SD
Red blood cells	See section II ALLOGENIC LABILE BLOOD PRODUCTS
Cryoprecipitate	10 ± 1
Granulocytes	338 ± 5
Apheresis frozen plasma	248 ± 7
Frozen Plasma CP2D	277 ± 22
CPD Frozen Plasma	220 ± 18
Pooled platelets	255 ± 10
Apheresis platelets	195 ± 16
Cryosupernatant	262 ± 21

Results from 01-01-2022 to 12-31-2022.

NUMBER, RATES AND RATIO OF TRANSFUSION REACTIONS AND ERRORS BASED ON THE TYPE OF LABILE BLOOD PRODUCT ADMINISTERED, REPORTED TO THE QUÉBEC HAEMOVIGILANCE SYSTEM IN 2019

	Red cell concentrates (205,276 units)			Platelets						Plasma (29,963 units)			All products (299,879 units)[a]		
				Apheresis (34,926 units)			WBDP (3,077 pools)								
	N	Rates	Ratio	N	Rates	Ratio	N	Rates[c]	Ratio[c]	N	Rates	Ratio	N[b]	Rates	Ratio
Transfusion accident															
Febrile non hemolytic reaction	387	188.5	1 : 1,530	94	269.1	1 : 372	5	162.5	1 : 615	9	30.0	1 : 3,329	497	165.7	1 : 603
Minor allergic reaction	119	58.0	1 : 1,725	145	415.2	1 : 241	10	325.0	1 : 308	51	170.2	1 : 588	329	109.7	1 : 911
Delayed serological reaction	224	109.1	1 : 916	1	2.9	1 : 34,926	0						225	75.0	1 : 1,333
Acute post transfusion pulmonary edema	68	33.1	1 : 3,019	10	28.6	1 : 3,493	0			5	16.7	1 : 5,993	83	27.7	1 : 3,613
Hypotensive reactions	14	6.8	1 : 14,663	1	2.9	1 : 34,926	0						16	5.3	1 : 18,742
Transfusion-associated acute dyspnea	10	4.9	1 : 20,528	4	11.5	1 : 8,732	0						14	4.7	1 : 21,420
Severe allergic reaction	2	1.0	1 : 102,638	5	14.3	1 : 6,985	0			4	13.3	1 : 7,491	12	4.0	1 : 24,990
Unknown reaction[d]	11	5.4	1 : 18,661				0						111	3.7	1 : 27,262
Delayed hemolytic reaction	10	4.9	1 : 20,528				0						10	3.3	1 : 29,988
Atypical pain	7	3.4	1 : 29,325				0						7	2.3	1 : 42,840

NUMBER, RATES AND RATIO OF TRANSFUSION REACTIONS AND ERRORS BASED ON THE TYPE OF LABILE BLOOD PRODUCT ADMINISTERED, REPORTED TO THE QUÉBEC HAEMOVIGILANCE SYSTEM IN 2019

	Red cell concentrates (205,276 units)			Platelets						Plasma (29,963 units)			All products (299,879 units)[a]		
				Apheresis (34,926 units)			WBDP (3,077 pools)								
Transfusion accident	**N**	**Rates**	**Ratio**	**N**	**Rates**	**Ratio**	**N**	**Rates[c]**	**Ratio[c]**	**N**	**Rates**	**Ratio**	**N[b]**	**Rates**	**Ratio**
Immediate hemolytic reaction	4	1.9	1 : 51,319	1	2.9	1 : 34,926	1	32,5	1 : 3,077	1	3.3	1 : 29,963	7	2.3	1 : 42,840
Soreness at puncture site	3	1.5	1 : 68,425				0						3	1.0	1 : 99,960
Isolated tachycardia	2	1.0	1 : 102,638	1	2.9	1 : 34,926							3	1.0	1 : 99,960
TRALI										1	3.3	1 : 29,963	1	0.3	1 : 299,879
Deaths	2	1.0	1 : 102,638										2	0.7	1 : 149,940
Sub total reactionse	**861**	**419.4**	**1 : 238**	**262**	**750.2**	**1 : 133**	**16**	**520.0**	**1 : 192**	**71**	**237.0**	**1 : 422**	**1,218**	**406,2**	**1 : 246**
Sub total reports with one or more transfusion-associated reactionsg	**849**	**413.6**	**1 : 242**	**259**	**741.6**	**1 : 135**	**14**	**455.0**	**1 : 220**	**71**	**237.0**	**1 : 422**	**1,201**	**400.5**	**1 : 250**

[a] This number includes units of cryoprecipitates/supernatants and granulocytes that do not appear in this table.
[b] The line total may be greater than the sum of the values because it includes transfusion reactions related to cryoprecipitates and granulocytes that do not appear in the table.
[c] Rates and ratios have been calculated by combining five units of platelet concentrates derived from whole blood.
[d] This category consists mainly of cases that presented various signs and symptoms that did not correspond to the definition of one or other recognized transfusion reaction (investigation results).

PUB-00038(2) • Effective date: October 2023

PUB-00038(2) • Effective date: October 2023

NOTES

NOTES

NOTES

NOTES

HÉMA-QUÉBEC

PUB-00038[2] • Effective date: October 2023

Original text in French. In the event of a discrepancy between the English and French versions, the latter will prevail.