ORBCoN
Ontario Regional Blood Coordinating Network

Inspiring and facilitating best transfusion practices in Ontario.

SOLVENT DETERGENT PLASMA: IS THIS WASHED PLASMA OR …

Donna Berta RN, BScN
Clinical Project Coordinator – Nursing
Ontario Regional Blood Coordinating Network (ORBCoN)

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Speaker Disclosure

- No commercial product conflicts of interest to declare.
- Transfusion Transmitted Injuries Surveillance System, member Education Committee.
- Using Blood Wisely initiative, member nursing education development.
- Canadian Society of Transfusion Medicine, member Standards Committee.

Pre Transfusion Knowledge Question 1

The transition to pathogen-reduced plasma (solvent detergent [S/D] plasma, Octaplasma™) provides an additional layer of safety to Canada's blood supply system.

The additional safety includes

a) Decreased risk of allergic transfusion reactions.
b) Inactivating all viruses.
c) Inactivating all bacteria.
d) Pooled product, patient/recipient blood group not relevant.

Pre Transfusion Knowledge Question 2

Emma is a 23-year-old female trauma patient in your emergency department. Massive hemorrhage protocol is ordered. Blood group & screen test results are pending.

Select the plasma (S/D plasma) blood group to be transfused:

a) Group O, Rh positive.
b) Group O, Rh negative.
c) Group AB, Rh negative.
d) Group AB (Rh is not relevant for plasma transfusion).

Pre Transfusion Knowledge Question 3

When transfusing S/D plasma:

a) Visual inspection of the product is not necessary; some visible particulates or clumping is okay.
b) Compatible with all IV fluids (0.9% sodium chloride (NaCl), 5% dextrose in water (D5W), Ringer's Lactate).
c) Use standard blood tubing with a 170 to 260 micron filter.
d) Infuse as quickly as possible (half-life of coagulation proteins is less than 30 minutes).

Solvent Detergent (S/D) Plasma: Is this Washed Plasma or …

Transfusion in Ontario (April 1, 2022 to March 31, 2023)

(per ORBCoN annual hospital site visit template)

	N transfused / fiscal year	N transfused / day (approximate)
Red Blood Cells	347,752 units	953 units
Platelets	58,524 doses	160 doses
Plasma Components (excludes cryoprecipitate and S/D plasma)	39,611 units	109 units

Solvent Detergent (S/D) Plasma: Is this Washed Plasma or …

Learning Objectives:

After this session participants will be able to:

- Understand the unique features of Solvent Detergent (S/D) plasma & its clinical indications.
- Define nursing actions to safely administer S/D plasma (dose, compatibility, checking, tubing & filter, infusion rate, patient monitoring, possible adverse reactions).

NOTE: This presentation provides evidence informed information and is also based on interpretation of TM Standards and Best Practice.
Refer to your hospital policies and procedures to guide your day-to-day practice.

Solvent Detergent (S/D) Plasma: Is this Washed Plasma or …

Outline:

- What is plasma?
- What is different about S/D plasma?
- Why is use of S/D plasma increasing now?

FP and S/D plasma

- Clinical Indications / Transfusion Guidelines.
- Dose.
- Compatibility.
- Administration checks.
- Tubing / filter, IV fluid and devices.
- Infusion rate.
- Patient monitoring.
- Possible adverse reactions.

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What is plasma?

Plasma

- Liquid part of blood, contains various types of proteins, including coagulation proteins necessary for the clotting process to stop bleeding.
- Stored frozen (preserves levels of certain coagulation proteins).

- Frozen plasma (FP) is produced from whole blood donation (frozen within 24 hours of collection).
- Apheresis frozen plasma (AFP) is produced via apheresis technology donation (frozen within 8 hours of collection).

- FP & AFP have similar levels of all non-labile coagulation factors (type of anticoagulant is indicated on the label).
- 1 unit mean volume: FP – 289 mL; AFP – 249 mL.

What is different about S/D plasma?

S/D plasma (Octaplasma™)

- Produced from large pools of plasma [many (630 – 1520) individual donations of the same ABO blood group]. Each bag is labelled with its specific ABO blood group.
- Undergoes pathogen reduction: treated with solvent detergent agents, then these agents are removed, followed by sterile filtration (Lipid-enveloped viruses inactivated; leukocytes depleted; prions removed).
- "Pool" is divided into 200 mL individual units (45 - 70 mg/mL human plasma proteins). All S/D plasma units have a uniform volume of 200 mL.
- All clotting factors levels are similar to FP, except for lower protein S and anti-plasmin levels.
- Pooling dilutes antibodies, allergens, and cytokines; decreases risk of allergic reactions, transfusion related acute lung injury (TRALI).
- FP & S/D plasma **clinical indications are the same.**
  There are some differences in the products, leading to significant change in hospital transfusion practice (in TML and for transfusionists).

Why is use of S/D plasma increasing now?

- July 2022, Canadian Blood Services (CBS): plan to **transition to pathogen-reduced platelet & plasma components** as an additional layer of safety to the blood supply system in Canada (in addition to donor screening and testing of each blood donation).
- S/D plasma has been used in Canada since 2011 for select patients (undergoing plasmapheresis treatment and significant pulmonary comorbidities or allergic reactions to FP).
  S/D plasma has been widely used in Europe for several decades (primary plasma product in some countries).

CBS Pathogen-Reduced Plasma Plan:

- Phase 1: transition from FP to S/D plasma - target of 80% of all transfused plasma to be S/D plasma by September 2023.
- Phase 2: (2024-25) replace the remaining 20% of FP with pathogen-reduced frozen plasma using the same technology (Intercept Blood System) currently used to produce pathogen-reduced platelets.

FP

S/D plasma

FP & S/D plasma **clinical indications are the same.**
There are some differences in the products, leading to significant change in hospital transfusion practice (in TML and for transfusionists).

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Patient Case 1, Question 1

Flo, a 69-year-old female underwent complex cardiac surgery (coronary artery bypass grafting, aortic valve replacement) 48 hours ago.
In the OR, transfused: 8 units RBC, 4 units S/D plasma, 1 dose platelets.

Now, Flo is recovering well (extubated, on oxygen 1 LPM, vital signs stable, tolerating sips of clear fluids, minimal/scant chest tube drainage).

Lab test results: Hb 78 g/L, platelets 88 X 10^9/L, INR 1.5

Flo's physician orders: Transfuse 4 units plasma, each unit over 1 hour.
Thirty minutes post transfusion, recheck INR.

Question 1: This is an appropriate **indication** for plasma transfusion.

a) yes
b) no

FP & S/D plasma
Clinical Indications / Transfusion Guidelines (1)

CBS Plasma Circular of Information; S/D plasma Octaplasma™ Product Monograph; Bloody Easy 5.1; National Advisory Committee on Blood and Blood Products (NAC)

- Bleeding or prior to a significant operative/invasive procedure in patients with INR ≥ 1.8 due to multiple factor deficiency when no coagulation factor concentrate, or other alternative therapy is available or is contraindicated.
- Microvascular bleeding or massive hemorrhage protocol (MHP) activated, *and* patient clinical status precludes waiting for INR/PTT test results.
- Patients with thrombotic thrombocytopenia purpura (TTP).
- Preparation of reconstituted whole blood.
- Replacement fluid for therapeutic plasmapheresis procedures.

NOTES:

- In the scenario of abnormal coagulation test results, to determine if plasma is indicated, the cause of the elevation must be determined (i.e., liver disease vs. warfarin effect vs. single factor deficiency).

FP & S/D plasma
Clinical Indications / Transfusion Guidelines (2)

NOTES continued:

- Liver disease patients have preserved thrombin generation despite elevated INR levels; often do not need correction of the abnormality before procedures.
- Plasma should not be used to treat hypovolemia.
- Plasma is not indicated/required when INR < 1.8 (coagulation factor levels are adequate for hemostasis).
- Don't transfuse plasma if INR elevated but patient is not actively bleeding.
- Don't transfuse plasma for reversal of heparin, low molecular weight heparin, warfarin, direct oral anticoagulants.
- *S/D plasma:* may give at the same time as FP.

- *S/D plasma contraindication:* patients with severe protein S deficiency. S/D plasma has significantly lower levels of protein S as compared to FP, which may result in an increased risk of blood clots. If patients with severe protein S deficiency require plasma transfusion, they should receive FP.

Patient Case 1, Question 2

Flo, a 69-year-old female underwent complex cardiac surgery (coronary artery bypass grafting, aortic valve replacement) 48 hours ago.
In the OR, transfused: 8 units RBC, 4 units S/D plasma, 1 dose platelets.

Now, Flo is recovering well (extubated, on oxygen 1 LPM, vital signs stable, tolerating sips of clear fluids, minimal/scant chest tube drainage).

Lab test results: Hb 78 g/L, platelets 88 X 10^9/L, INR 1.5

Flo's physician orders: Transfuse 4 units plasma, each unit over 1 hour.
Thirty minutes post transfusion, recheck INR.
Note: Flo's weight: 70 kg

Question 2: This is an appropriate **dose** for plasma transfusion for Flo.

a) yes
b) no
c) possibly

FP & S/D plasma Dose (1)

FP CBS Plasma Circular of Information

- Depends on the clinical situation and patient size.
- Common dosing is 10 - 15 mL per kg body weight.

S/D plasma Octaplasma™ Product Monograph

- Depends upon the clinical situation and underlying disorder.
- Generally accepted starting dose 12 - 15 mL per kg body weight (this should increase plasma coagulation factor levels by about 25%).

Historical Practice

- Adults: Large - 4 units; Small - 3 units

Both FP and S/D plasma are available in TML in units.

FP & S/D plasma Dose (2)

Follow hospital policy established by the transfusion medicine service.

Bloody Easy 5.1

- Indication - MHP, minimum ratio 2:1 RBC:plasma units.
- Table with 5 kg weight increments, dosing in mL (10 - 15 mL/kg).

NAC October 2023

- Indication - correction of abnormal coagulation tests.
- Provide suggestions/examples with logistical & pragmatic considerations (e.g., TML policy allowing for substitution of FP for S/D plasma (or vice versa) as needed due to inventory issues).
- Two example tables, first one 15-20 kg weight increments.
- Additional update pending (hopefully in December).

FP & S/D plasma Dose (3)

NAC October 2023

Example dose range table S/D plasma & FP (mL & units).

Weight (kg)	10 mL/kg[5]	15 mL/kg[6]	S/D plasma dose[1,2]	FP dose[1,3]
< 40 kg	--	--	12 mL/kg	12 mL/kg
40 - 44.9 kg	450 mL	600 mL	3 units	2 units
45 - 49.9 kg	500 mL	675 mL	3 units	2 units
50 - 54.9 kg	550 mL	750 mL	3 units	2-3 units
55 - 59.9 kg	600 mL	825 mL	3-4 units	3 units
60 - 64.9 kg	650 mL	900 mL	4 units	3 units
65 - 69.9 kg	700 mL	975 mL	4 units	3 units
70 - 74.9 kg	750 mL	1050 mL	4-5 units	3 units
75 - 79.9 kg	800 mL	1125 mL	4-5 units	3-4 units
80 - 84.9 kg	850 mL	1200 mL	5-6 units	4 units
85 - 89.9 kg	900 mL	1275 mL	5-6 units	4 units
90 - 94.9 kg	950 mL	1350 mL	5-6 units	4 units
95 - 99.9 kg	1000 mL	1425 mL	6 units	4-5 units
100+ kg[4]	1000 mL	1425 mL	6 units	4-5 units

1. Dose calculated using middle weight x 12.5 mL/kg.
2. Number of S/D plasma units calculated using a unit volume of 200 mL.
3. Number of FP units calculated assuming a mean unit volume of 289 mL.
4. For weights above 100 kg, the plasma dose is capped using 100 kg dose.
5. Dose for 10 mL/kg calculated using upper weight for each category.
6. Dose for 15 mL/kg calculated using lower weight for each category.

FP & S/D plasma
Neonate Notes & Pediatric Pearls

NAC

Neonates

- Based on limited data, there is no reason to expect differences in clinical efficacy with S/D Plasma as compared to FP.

Pediatrics

- Based on limited data, S/D Plasma and FP should be considered equally effective in pediatric patients and can be used interchangeably.

Bloody Easy 5.1

- Dose: 10-15 mL/kg including for pediatrics.

Patient Case 1, Question 3

Flo, a 69-year-old female underwent complex cardiac surgery (coronary artery bypass grafting, aortic valve replacement) 48 hours ago.
In the OR, transfused: 8 units RBC, 4 units S/D plasma, 1 dose platelets.

Now, Flo is recovering well (extubated, on oxygen 1 LPM, vital signs stable, tolerating sips of clear fluids, minimal/scant chest tube drainage).

Lab test results: Hb 78 g/L, platelets 88 X 10^9/L, INR 1.5

Flo's physician orders: Transfuse 4 units plasma, each unit over 1 hour.
Thirty minutes post transfusion, recheck INR.

Question 3: Assess response to plasma clinically & by repeating INR 30-60 minutes post transfusion.

a) yes
b) no

Patient Case 2, Question 1

Note: This fictitious case is presented solely to discuss administration of plasma and does not necessarily reflect current treatment for patients with liver disease.

Freddy, a 59-year-old male with cirrhosis of the liver, is awaiting liver transplant. Unfortunately, he fell and has fractured his hip. He requires urgent hip surgery. Freddy's weight is 80 kg.

Lab test results: INR 2.5

Freddy's physician orders: Transfuse 4 units plasma, each unit over 1 hour. Thirty minutes post transfusion, recheck INR.

Question 1: For the plasma transfusion, Freddy requires a blood group test.

a) yes
b) no

FP & S/D plasma Compatibility

Plasma Compatibility

- Patients should be transfused plasma that is ABO compatible with their own red blood cells (antigens).
- Anti-A and/or anti-B antibodies in transfused plasma can hemolyse the patient's RBCs, if the patient's RBCs have the corresponding antigen on their surface.
- Rh(D) blood group is not relevant for plasma transfusion (plasma is a non-cellular blood component [i.e., no antigens]).

Compatibility Table

Patient ABO/Rh(D) Blood Group	Compatible Blood Group for Transfusion			
	RBC	Platelets	Plasma	Cryoprecipitate
O Positive	O Rh(D) positive or negative	O preferred** Rh(D) positive or negative	O, A, B, AB	Any Group Note: Very infrequently used component. Cryoprecipitate is interchangeable with Fibrinogen Concentrate for fibrinogen replacement.
O Negative	O Rh(D) negative*	O preferred** Rh(D) negative*	O, A, B, AB	
A Positive	A, O Rh(D) positive or negative	A preferred** Rh(D) positive or negative	A, AB	
A Negative	A, O Rh(D) negative*	A preferred** Rh(D) negative*	A, AB	
B Positive	B, O Rh(D) positive or negative	B preferred** Rh(D) positive or negative	B, AB	
B Negative	B, O Rh(D) negative*	B preferred** Rh(D) negative*	B, AB	
AB Positive	AB, A, B, O Rh(D) positive or negative	AB preferred** Rh(D) positive or negative	AB	
AB Negative	AB, A, B, O Rh(D) negative*	AB preferred** Rh(D) negative*	AB	

* In urgent bleeding patient situations or during times of short supply, Rh(D) negative patients may need to receive Rh(D) positive RBC and platelets.

** Platelets should be ABO compatible with patient's red blood cells (donor platelets are suspended in plasma). In urgent bleeding patient situations or during times of short supply, TML will follow established policies for ABO group substitution for platelets.

Patient Case 2, Question 2

Note: This fictitious case is presented <u>solely to discuss administration of plasma</u> and does not necessarily reflect current treatment for patients with liver disease.

Freddy, a 59-year-old male with cirrhosis of the liver, is awaiting liver transplant. Unfortunately, he fell and has fractured his hip. He requires urgent hip surgery. Freddy's weight is 80 kg.

Lab test results: INR 2.5

Freddy's physician orders: Transfuse 4 units plasma, each unit over 1 hour. Thirty minutes post transfusion, recheck INR.

Freddy's ABO blood group result: O

Question 2: Freddy's first unit of plasma is still not ready (it has been almost 1 hour since his ABO blood group test result was posted). His nurse should call TML to find out what is taking so long.

a) yes
b) no
c) possibly

FP & S/D plasma
Thawing plasma

	FP	S/D plasma
Shelf-life	12 months, frozen, at ≤ minus 18°C (approved, monitored freezer).	48 months, frozen, at ≤ minus 18°C (approved, monitored freezer).
Thawing (thawing system validated for this purpose, e.g., water bath; dry tempering system; multiple bags can be thawed in parallel in some thawing systems)	May take 20 - 30 minutes.	For not less than 30 minutes; should not be longer than 60 minutes. Allow to warm to approximately 37 °C before infusion.
Thawed Shelf-life	5 days (120 hours), at 1-6°C (approved, monitored refrigerator).	5 days (120 hours), at 2-8°C (approved, monitored refrigerator). Ideally, should be thawed shortly before use (within 1-2 hours). Pre-thawed, long-term-storage should be used only as an exception in cases where time plays a crucial role, e.g., MHP

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Note: This fictitious case is presented solely to discuss administration of plasma and does not necessarily reflect current treatment for patients with liver disease.

Freddy, a 59-year-old male with cirrhosis of the liver, is awaiting liver transplant. Unfortunately, he fell and has fractured his hip. He requires urgent hip surgery. Freddy's weight is 80 kg.

Lab test results: INR 2.5

Freddy's physician orders: Transfuse 4 units plasma, each unit over 1 hour. Thirty minutes post transfusion, recheck INR.

Freddy's ABO blood group result: O
For Freddy, TML has issued S/D plasma, blood group O

Question 3: When checking the S/D plasma, the product lot number should be verified as identical and also recorded on Freddy's health record.

a) yes
b) no

FP & S/D plasma Administration checks (1)

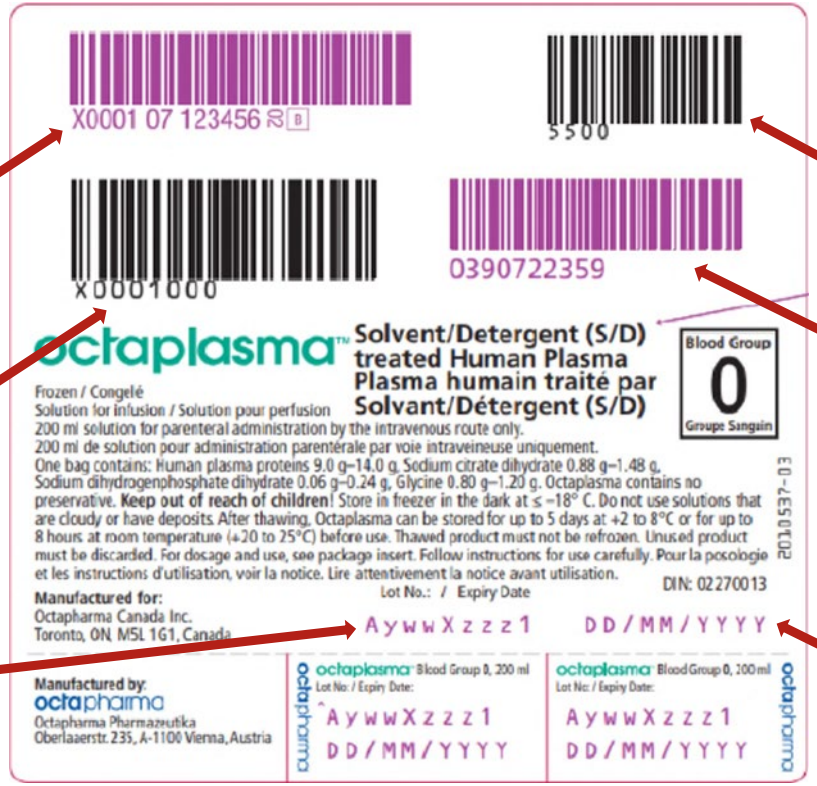
- Blood received from TML aligns with the order.
- Unequivocal (unmistakable) identification of the patient is mandatory.
- TM patient identifiers: surname, first name, unique identification number
- Patient must be wearing a patient identification armband.
- Patient identification information must remain attached to blood during transfusion.

For safety, at the bedside in the presence of the patient, follow 4 steps

1. Patient Identification (Order, Armband, Transfusion label, Chart label/issue form)
2. ABO Blood Group (Group & screen test result; Manufacturer label [FP: CBS; S/D plasma: Octapharma]; Transfusion label, Chart label/issue form)
3. Unit number (Manufacturer label [FP: CBS; S/D plasma: Octapharma]; Transfusion label; Chart label/issue form)
4. Expiry & Visual Inspection (Transfusion label; Chart label/issue form; Blood product)

S/D plasma
Administration checks (2)

Manufacturer S/D plasma label (per Octapharma, ISBT128 compliant)



Unit number, begins with "X"
Unique to each S/D plasma unit

Product name bar code

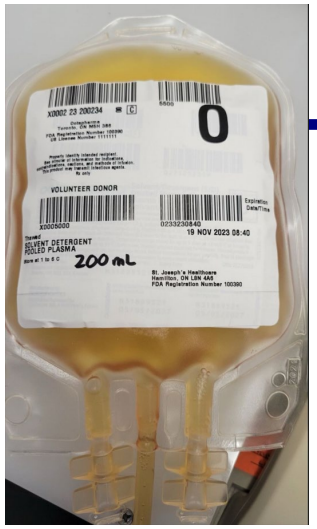
Octapharma lot number

Blood group bar code

Expiry date bar code
(date of production
+ 48 months)

Expiry date
(date of production
+ 48 months)

S/D plasma
Administration checks (3)



Re-print thawed S/D plasma label (Hospital TML, ISBT128 compliant)

Unit number, begins with “X”
Unique to each S/D plasma unit

Product name bar code

Blood group bar code

Expiry date/time bar code
Expiry date/time
date/time of thawing
+ 5 days (120 hours)

S/D plasma Administration checks (4)

Transfusion Label (Hospital TML)

Surname, first name

Unique identification number

Product name

Unit number, begins with “X”
Unique to each S/D plasma unit

Patient blood group

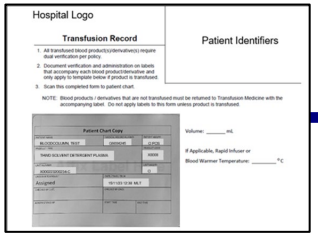
Unit blood group

PATIENT NAME	PATIENT ABO/Rh
BLOODCOLUMN, TEST	O POS
MEDICAL RECORD NUMBER	LOCATION
G9004245	Hospital Ward
PRODUCT TYPE	PRODUCT CODE
THWD SOLVENT DETERGENT PLASMA	X0008
UNIT NUMBER	UNIT ABO/Rh
X000223200234-C	O
CROSSMATCH RESULT	DATE / TIME / TECH
Assigned	15/11/23 12:38 MLT

Hospital name & address

Independent double check required prior to starting the administration.
DO NOT transfuse if there is a discrepancy.

S/D plasma Administration checks (4)


Hospital Logo

Transfusion Record

Patient Identifiers

Chart Label / Issue Form (Hospital TML)

Unique identification number

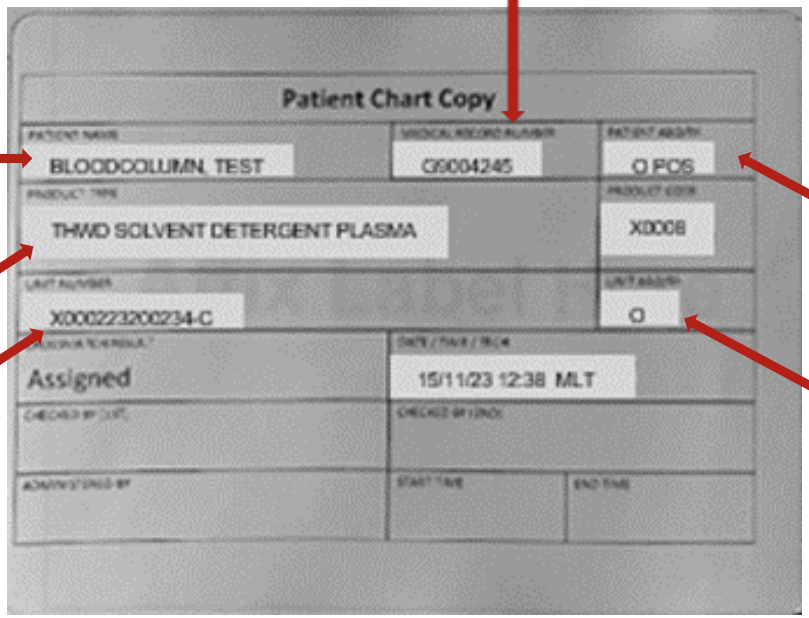
Surname, first name

Product name

Unit number, begins with “X”
Unique to each S/D plasma unit

Patient blood group

Unit blood group



S/D plasma
Administration checks (4)

Expiry, “Complete transfusion by” (Hospital TML & Transfusionist)

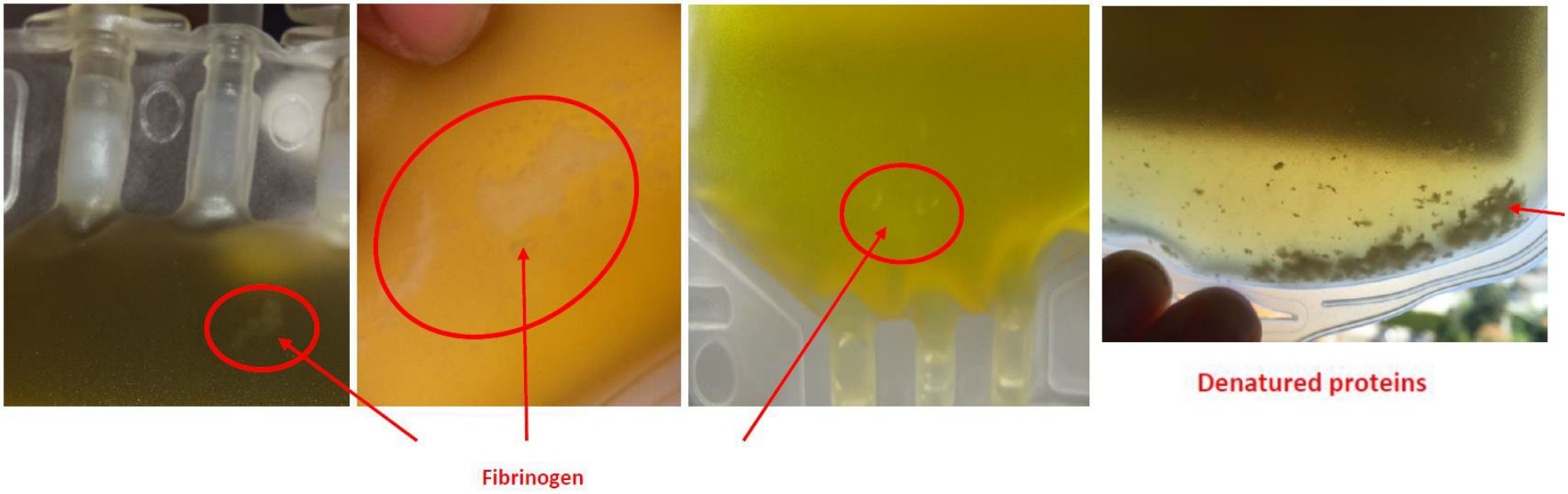
	FP	S/D plasma
Complete Transfusion By	Within 4 hours of removal from storage.	Within 4 hours of spiking the bag AND Can be stored for up to 8 hours at room temperature (20-25°C) before use.

S/D Plasma

- Issue Time (removal from temperature-controlled environment); transfusionist needs to know issue time to ensure transfusion safety.

S/D plasma
Administration checks (4)

Visual Inspection (Hospital TML & Transfusionist)



S/D Plasma

Do not transfuse products that are cloudy, have visible particulates/ precipitates, clumping or have deposits.

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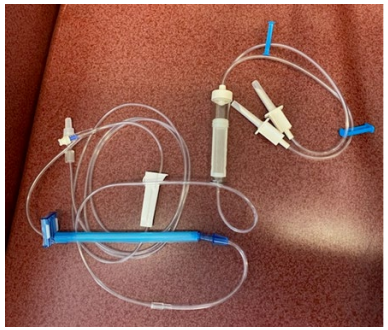
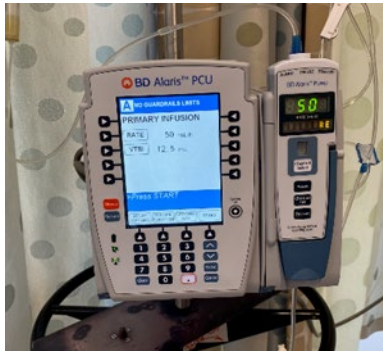
FP & S/D plasma
Tubing / filter, IV fluid and devices



Blood tubing / filter



Alaris or Baxter pump

Level 1 rapid infuser

Pressure bag

Hotline blood warmer

- Blood tubing with 170-260 micron filter.
- Blood tubing / filter use for a maximum of 4 units of blood or 4 hours of time.
- Can be given concurrently with FP or other blood products.
- IV fluid: 0.9 % NaCl (sodium chloride).
- Prime tubing: 0.9 % NaCl or plasma
- IV setup: to stop abruptly & maintain IV access
  - 0.9% NaCl flush syringes + any IV fluid line
    or
  - 0.9% NaCl IV line
- NO medications are compatible.

Devices

- Only those approved per Health Canada Medical Device Regulations.
- Use based on manufacturer's recommendations & equipment quality control system (validated, calibrated, and maintained).

Patient Case 2, Question 4

Note: This fictitious case is presented solely to discuss administration of plasma and does not necessarily reflect current treatment for patients with liver disease.

Freddy, a 59-year-old male with cirrhosis of the liver, is awaiting liver transplant. Unfortunately, he fell and has fractured his hip. He requires urgent hip surgery. Freddy's weight is 80 kg.

Lab test results: INR 2.5

Freddy's physician orders: Transfuse 4 units plasma, each unit over 1 hour. Thirty minutes post transfusion, recheck INR.

For Freddy, TML has issued S/D plasma, blood group O

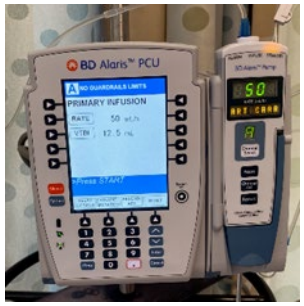
Question 4: When transfusing each unit of S/D plasma, best practice is to infuse at 50 mL/hour, over 4 hours.

a) yes
b) no

FP & S/D plasma
Infusion rate (1)

If patient's clinical status permits (i.e., patient stable, not bleeding; transfusion not urgent) initiate transfusion cautiously and slowly.

- For the first 15 minutes,



<u>Adults</u>
50 mL/hour

<u>Neonate/Pediatric</u>
1 mL/kg/hour, up to 50 mL/hour

Note: If tubing/filter was primed with 0.9% NaCl, then re-prime tubing with plasma to ensure initial slow infusion rate is infusing plasma *(Blood tubing volume: Alaris ≈ 33 mL; Baxter ≈ 15 mL)*

- After 15 minutes, assess patient and re-check vital signs.
- If no signs/symptoms of transfusion reaction, increase to rate ordered.
- Administer plasma immediately prior to planned procedures.

FP & S/D plasma
Infusion rate (2)

FP

- over 30 -120 minutes; maximum is 4 hours from time of issue from TML.

S/D plasma

- Best practice - as for FP.
- Product monograph *maximum* 1 mL/kg/minute (70 kg patient, 1 unit in 3 minutes)
- Plasmapheresis machine rates: 100 - 250 mL/minute
- Rapid infuser rates: 750 -1000 mL/minute
- Some discussions regarding rapid infusions (MHP), citrate anticoagulant in S/D plasma, potential for citrate toxicity (citrate binds calcium). Concentration of citrate in S/D plasma & FP are similar. In MHP scenarios, benefit of rapid infusion outweighs the potential risk for citrate toxicity (as well, giving added calcium is part of MHP).

If TACO risk (Transfusion Associated Circulatory Overload)

- *prevention strategies (slower)*

ATTENTION

Patients receiving plasma are at high risk for Transfusion-Associated Circulatory Overload (TACO)!

FP & S/D plasma TACO

TACO (Transfusion Associated Circulatory Overload)

- Leading cause of transfusion related deaths; Prevention is imperative!
- Occurs secondary to transfusion at a rapid rate and/or the specific patient's cardiac capacity is unable to tolerate transfusion fluid volume.
- Signs: acute/worsening respiratory distress, decreased oxygen saturation, tachycardia, increased blood pressure, acute pulmonary edema.

TACO Risk Factors

- Advanced age
- History of heart failure
- History of myocardial infarction
- Left ventricular dysfunction
- Renal dysfunction
- Positive fluid balance

If risk, review with prescriber for prevention strategies

TACO Prevention Strategies

- Transfuse only 1 unit at a time
- Transfuse slowly over longer time period (maximum 4 hours per unit)
- **Pre-transfusion diuretic** (PO – 30 minutes prior; IV – just prior)
- TML to divide unit (if equipment available, then transfuse each part over maximum 4 hours)

Patient Case 2, Question 5

Note: This fictitious case is presented <u>solely to discuss administration of plasma</u> and does not necessarily reflect current treatment for patients with liver disease.

Freddy, a 59-year-old male with cirrhosis of the liver, is awaiting liver transplant. Unfortunately, he fell and has fractured his hip. He requires urgent hip surgery. Freddy's weight is 80 kg.

Lab test results: INR 2.5

Freddy's physician orders: Transfuse 4 units plasma, each unit over 1 hour. Thirty minutes post transfusion, recheck INR.

Freddy has been transfused about 3 ½ units of S/D plasma. His wife notes he is now quite short of breath. Freddy's nurse comes to assess.

Question 5: **<u>Immediately</u>**, Freddy's nurse should check his vital signs and call his physician.

a) yes
b) no

FP & S/D plasma
Possible adverse reactions

- If a possible acute transfusion reaction is suspected:
  - 

Stop the transfusion
  - Maintain IV access
  - Check vital signs
  - Verify patient armband identification matches with transfusion label
  - Notify prescriber
  - Patient care as per order
  - Report reaction to TML
  - Document all details

- All unexpected, unusual or serious symptom(s) must be identified, managed and reported to TML for investigation.
- TML must report certain reactions to the Manufacturer/CBS/Health Canada.

FP & S/D plasma
Acute Reaction Chart (1)

IMMEDIATE ACTIONS!
1. **STOP** the transfusion
2. Maintain **IV access**
3. Check **vital signs**
4. Verify **patient ID matches** transfusion label/tag
5. **Notify physician**
6. **Patient care** per order, **report every reaction to Transfusion Medicine Lab (TML), document** per policy

TTISS-ON
Acute Transfusion Reaction Chart

SIGNS AND SYMPTOMS

FEVER, URTICARIA, DYSPNEA, HYPOTENSION

Airway or Facial Edema, Anxiety, Coughing, Diffuse bleeding/oozing, Hemoglobinuria, Hypertension, Itching, Nausea/Vomiting, Pain (Back, Headache, IV site), Rash, Shaking Chills/Rigors, Subjective chills, Tachycardia, Urine colour– dark/red, Wheezing

Consider Recommended Investigations and Suggested Treatment and Actions in the context of each patient's specific clinical scenario and blood component/product transfused.
The initial presenting sign/symptom may evolve, if so re-contact TML. Close patient monitoring is essential.
For additional assistance, call TML at extension: _____

SIGNS & SYMPTOMS		TIMING	POSSIBLE ETIOLOGY	RECOMMENDED INVESTIGATIONS	SUGGESTED TREATMENT AND ACTIONS
FEVER: Temperature of at least 38° C and an increase of at least 1° C from pre-transfusion **and/or** Shaking Chills/Rigors NOTE: Isolated symptom subjective chills, may consider as Low Risk	**Low Risk:** 38° C to 38.9° C but **NO** other symptoms	During or up to 4 hours post transfusion.	Febrile non-hemolytic transfusion reaction	No testing required	• Antipyretic • With physician order and if blood still viable, may resume transfusion with close patient assessment • If recurrent reactions, possible trial of antipyretic premedication
	High Risk: a) at least 38° C but **with** other symptoms **or** b) 39° C or greater **or** c) Shaking Chills/ Rigors	Often within first 15 minutes. During or up to 4 hours post transfusion.	Febrile non-hemolytic transfusion reaction Bacterial contamination Acute hemolytic transfusion reaction	• TML: Group & Screen, DAT • TML: Blood component culture • Patient blood culture (from a different peripheral site) • Urinalysis (first void post-reaction) • Hemolysis work-up: CBC, bilirubin, LDH, AST, haptoglobin, reticulocyte count, blood film • If indicated, assess for - AKI {Acute Kidney Injury} (electrolytes, creatinine) - DIC {Disseminated Intravascular Coagulation} (INR, PTT, fibrinogen, D-dimer)	**DO NOT restart transfusion** • Return blood to TML for clerical check & culture • Broad spectrum IV antibiotics; DO NOT wait for culture results • Aggressive hydration; maintain good urine output • Supportive care per physician's discretion: IV fluid, vasopressors, oxygen, respiratory support • Monitor for hypotension, renal dysfunction, DIC {Disseminated Intravascular Coagulation} • If severe rigors, consider meperidine (if no patient contraindications) • **Serious reaction, call TML immediately**
URTICARIA (Hives) Rash **or** Itching	Less than 2/3 body surface but **NO** other symptoms	During or up to 4 hours post transfusion.	Minor allergic	No testing required	• Antihistamine • With physician order and if blood still viable, may resume transfusion with close patient assessment • If recurrent/severe reactions, possible trial of antihistamine premedication
	2/3 body surface or more but **NO** other symptoms	Often early in transfusion. During or up to 4 hours post transfusion.	Minor allergic (Extensive)	No testing required	**DO NOT restart transfusion** • Antihistamine; may require steroid if symptoms slow to resolve • If recurrent/severe reactions, possible trial of antihistamine /steroid premedication • If continued reactions with premedication, possible trial of washed/plasma depleted components
	With other symptoms, i.e., Airway or Facial Edema, DYSPNEA, HYPOTENSION	Often early in transfusion. During or up to 4 hours post transfusion.	Anaphylactoid reaction /Anaphylaxis	• If also DYSPNEA: chest X-ray, • If also hypoxia: blood gases • Suggest consult Transfusion Medicine physician: explore if indication for - TML: Group & Screen, DAT - Haptoglobin - IgA level (if pre-transfusion sample available) - Anti-IgA testing (performed via Canadian Blood Services, TML will assist in sending samples)	**DO NOT restart transfusion** • **Epinephrine;** consider steroid, antihistamine • Return blood to TML for clerical check • Supportive care per physician's discretion: oxygen, respiratory support, vasopressors • Pending outcome of investigations, washed/plasma depleted components • **Serious reaction, call TML immediately**

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FP & S/D plasma
Acute Reaction Chart (2)

SIGNS & SYMPTOMS		TIMING	POSSIBLE ETIOLOGY	RECOMMENDED INVESTIGATIONS	SUGGESTED TREATMENT AND ACTIONS
DYSPNEA **or** SpO_2 (oxygen saturation) of 90 % or less and a decrease of at least 5 % from pre-transfusion **or** intervention required to maintain SpO_2 (oxygen saturation)	With **Hypertension,** tachycardia, +/- FEVER	During or up to **12 hours** post transfusion	TACO* (Transfusion Associated Circulatory Overload)	• TML: Group & Screen, DAT • Consider chest x-ray: Findings - pulmonary edema, Kerley B lines, peri bronchial cuffing; may be pleural fluid • Cardiac biomarkers (as available)	**DO NOT restart transfusion** • Oxygen, high fowler's position, diuretics (document fluid balance) • **Future transfusion:** Slow transfusion rate Pre-transfusion diuretics ** Consider TML to divide unit (as available)
	ACUTE DYSPNEA With **HYPOTENSION,** tachycardia, +/- FEVER	During or up to **6 hours** post transfusion	TRALI (Transfusion Related Acute Lung Injury)	• TML: Group & Screen, DAT • Chest x-ray: Findings – bilateral interstitial /alveolar infiltrates without elevated pulmonary pressures • If also hypoxia: blood gases • Canadian Blood Services requires follow up information & patient blood tests, contact TML, will assist in sending samples	**DO NOT restart transfusion** • Supportive care per physician's discretion: oxygen, respiratory support, vasopressors (benefit uncertain for diuretics (document fluid balance), steroids, and bronchodilators) • **Serious reaction, call TML immediately**
	With FEVER +/- HYPOTENSION	Possible Etiology: Bacterial contamination, Acute hemolytic transfusion reaction **Consider/Follow FEVER, High Risk:** Timing, Recommended Investigations, Suggested Treatment and Actions			
	With URTICARIA, Airway or Facial Edema, HYPOTENSION	Possible Etiology: Anaphylactoid Reaction / Anaphylaxis **Consider/Follow URTICARIA, With other symptoms:** Timing, Recommended Investigations, Suggested Treatment and Actions			
	Mild respiratory symptoms that do not align with TACO or TRALI	During or up to **24 hours** post transfusion	TAD (Transfusion Associated Dyspnea)	• Consider chest x-ray: Findings - normal/unchanged, no pulmonary edema, No bilateral interstitial/alveolar infiltrates	**DO NOT restart transfusion** • Supportive care per physician's discretion: oxygen, respiratory support
HYPOTENSION SBP (Systolic blood pressure) 80 mmHg or lower **AND** from pre-transfusion SBP: - 30 mmHg or greater absolute decrease **or** - 15 to 25 % or greater relative decrease **or** - intervention required to maintain SBP	Alone or with facial flushing	During or up to 4 hours post transfusion	***Bradykinin mediated hypotension	No testing required	**DO NOT restart transfusion** • Supportive care per physician's discretion: IV fluids • If taking ACE (angiotensin converting enzyme) inhibitor medication, consider an alternative anti-hypertensive agent prior to additional transfusion
	With FEVER, +/- DYSPNEA	Possible Etiology: Bacterial contamination, Acute hemolytic transfusion reaction **Consider/Follow FEVER, High Risk:** Timing, Recommended Investigations, Suggested Treatment and Actions			
	With URTICARIA, Airway or Facial Edema, DYSPNEA	Possible Etiology: Anaphylactoid Reaction / Anaphylaxis **Consider/Follow URTICARIA, With other symptoms:** Timing, Recommended Investigations, Suggested Treatment and Actions			
	With ACUTE DYSPNEA, tachycardia +/- FEVER	Possible Etiology: TRALI **Consider/Follow ACUTE DYSPNEA:** Timing, Recommended Investigations, Suggested Treatment and Actions			

*** TACO: Pre-transfusion assess patients for TACO risk factors:** advanced age, history heart failure, history myocardial infarction, left ventricular dysfunction, renal dysfunction, positive fluid balance

**** Pre-transfusion diuretics:** Furosemide PO: onset 30 to 60 minutes, maximal effect 1-2 hours, effect persists about 6-8 hours
Furosemide IV: onset 5 minutes, maximal effect 20-60 minutes, effect persists about 2 hours

***** Bradykinin mediated hypotension**
Bradykinin is believed to have a major role in producing hypotension. Patients taking ACE (angiotensin converting enzyme) inhibitor medication - decreased bradykinin degradation related to increased angiotensin converting enzyme. Also, some individuals have genetic polymorphism leading to decreased bradykinin degradation.

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FP & S/D plasma
Transfusion Checklist

TRANSFUSION CHECKLIST

For references, refer to Bloody Easy Blood Administration Version 3, Summary: Transfusionist's Accountability: Transfusion Checklist (page 80-89).

Unequivocal (unmistakeable) identification of the patient is mandatory.

Patient must be wearing a patient identification armband. Patient identification information must remain attached to the blood for the duration of the transfusion.

PRE-TRANSFUSION

✓ **Informed Consent**
- Per policy/procedure, questions addressed
- Exception: emergent, life-threatening bleed

✓ **Transfusion Order**
- Indication supported: labs, signs, symptoms
- Complete, required information included

✓ **Group & Screen Testing**
- Required for compatible blood components
- ABO, Rh(D) blood groups, antibody screen (clinically significant antibodies)
- Label tube of blood at patient's bedside

✓ **Prepare the Patient**
- Educate: symptoms indicative of reaction
- Assess for transfusion history and TACO risk factors; follow up if indicated

✓ **Prepare the Equipment**
- Dedicated, patent IV (peripheral or central)
- Compatible IV fluid (only 0.9 % NaCl [sodium chloride] for blood components)
- Blood components – tubing/filter (170-260 microns); change after 4 units or 4 hours
- Platelets – always NEW/FRESH tubing/filter
- Prime tubing/filter: blood or compatible IV fluid
- IV setup to stop abruptly & maintain TKVO: 0.9% NaCl flush syringes + any fluid IV line or 0.9% NaCl IV line
- Infusion Devices: if Health Canada approved

✓ **Pick Up Blood from TML** (Transfusion Medicine Lab)
- Patient identification (surname, first name, unique identification number) and order

TRANSFUSION

✓ **Checking Blood Components/Blood Products**
- Blood received matches transfusion order
- At bedside, in physical presence of patient
- **1. Patient Identification:** surname, first name, unique identification number **identical** on armband, order, transfusion & chart label/tag
- **2. ABO, Rh(D) Blood Groups (only for Components): identical/compatible** on Group & screen test, CBS (Canadian Blood Services) label, transfusion & chart label/tag
- **3. Unit (Components) / Lot (Products) Number: identical on** CBS label (Components) / manufacturer label (Products), transfusion & chart label/tag
- **4. Visual Inspection & Expiry**
  Components: no clots, usual colour, ports intact, expires 4 hours after issue from TML
  Products: packaging/seal intact, colour as per manufacturer, vials/glass bottles – once entered/spiked, expires after 4 hours

✓ **Patient Assessment and Vital Signs** (for each unit)
- Close monitoring/observation required
- Minimum: within 30 minutes of starting, 15 minutes after starting, upon completion
- Temp, BP, pulse, respiratory rate, oxygen saturation; if TACO risk - chest auscultation

✓ **Infusion Rate** (for each unit)
- 50 mL/hour for first 15 minutes; can be deferred if acute bleeding
- Re-check after 15 minutes, if no indication of reaction then increase to rate as ordered

✓ **Possible Transfusion Reaction**
- If any adverse/unexpected/serious symptoms, **STOP** transfusion; refer to TTISS Reaction Chart

POST-TRANSFUSION

✓ **Completing the Transfusion**
- Comply with expiry time specific for blood component/blood product
  Outside the expiry time, discard remainder
- Component tubing: flush with 0.9 % NaCl
- Products given IV: flush (tubing/IV site) with compatible IV fluid
- Some hospitals require returning the empty blood bag to TML
  Otherwise dispose of blood tubing/bags in biohazardous waste
- Re-assess patient and re-check vital signs:
  - at end of transfusion
  - periodically post-transfusion (reactions may occur 4 hours post-transfusion; for dyspnea reactions up to 24 hours post transfusion)

✓ **Documentation**
- File completed chart label/tag for each component or product transfused on patient's health record (include start and stop times)
- Some hospitals require a completed "transfusion record" form returned to TML
- Record volume transfused, vital signs and patient assessments
- If a transfusion reaction is suspected: report to TML, document signs and symptoms, patient care

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Post Transfusion Knowledge Question 1

The transition to pathogen-reduced plasma (solvent detergent [S/D] plasma, Octaplasma™) provides an additional layer of safety to Canada's blood supply system.

The additional safety includes

a) Decreased risk of allergic transfusion reactions.
b) Inactivating all viruses.
c) Inactivating all bacteria.
d) Pooled product, patient/recipient blood group not relevant.

Post Transfusion Knowledge Question 2

Emma is a 23-year-old female trauma patient in your emergency department. Massive hemorrhage protocol is ordered. Blood group & screen test results are pending.

Select the plasma (S/D plasma) blood group to be transfused:

a) Group O, Rh positive.
b) Group O, Rh negative.
c) Group AB, Rh negative.
d) Group AB (Rh is not relevant for plasma transfusion).

Post Transfusion Knowledge Question 3

When transfusing S/D plasma:

a) Visual inspection of the product is not necessary; some visible particulates or clumping is okay.
b) Compatible with all IV fluids (0.9% sodium chloride (NaCl), 5% dextrose in water (D5W), Ringer's Lactate).
c) Use standard blood tubing with a 170 to 260 micron filter.
d) Infuse as quickly as possible (half-life of coagulation proteins is less than 30 minutes).

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Solvent Detergent (S/D) Plasma: Is this Washed Plasma or …

Email: bertad@mcmaster.ca