

Blood Type Compatibility and Transfusion Reactions

This pocket card reviews blood type compatibility, the different types of transfusion reactions that can occur, signs and symptoms, and treatment strategies.

Blood Type Compatibility (American Red Cross, n.d.)

Blood types are determined by antigens, substances that trigger an immune response when seen as foreign to the body. Some antigens can cause a patient's immune system to attack transfused blood. Whole blood, red blood cells (RBCs), leukocyte-poor RBCs, white blood cells (WBCs), and platelets must be ABO and Rh type and cross-matched for antibodies to be safely transfused.

There are four major blood groups based on the presence or absence of two antigens, A and B, located on the surface of red blood cells. There is also a protein called Rh factor which can be present (+) or absent (-).

- The universal red cell donor has Type O- blood.
- The universal red cell recipient has AB+ blood.

It is important to note that in emergency situations, when the recipient's blood type is unknown, the person can receive type O-negative red cells without producing an ABO or RhD incompatibility reaction. In other situations, even non-emergent ones, where the recipient's specific blood type is known but there is no type-specific blood available, a compatible type may be used if it is determined to be compatible through cross-matching. Cross-matching is a simple and commonly practiced laboratory test that verifies blood compatibility.

Blood Type Compatibility									
Blood type of donor									
Blood type of recipient		O-	O+	A-	A+	B-	B+	AB-	AB+
	AB+	√	√	√	√	√	√	√	√
	AB-	√		√		√		√	
	B+	√	√			√	√		
	B-	√				√			
	A+	√	√	√	√				
	A-	√		√					
	O+	√	√						
	O-	√							

Transfusion Reactions (Tobian, 2024)

Transfusion reactions typically occur from a major antigen-antibody reaction. The severity of the reaction can range from mild to life-threatening. An acute reaction can occur within 24

hours of transfusion completion, but severe reactions typically occur within the first 15 minutes of initiating the transfusion.

For information about blood transfusions, see NursingCenter Pocket Card: [Blood Products and Transfusions](#)

Signs of a potential transfusion reaction

- Mild symptoms that often resolve without treatment or complications
 - Fever
 - Chills
 - Pruritus (severe itching)
 - Urticaria (hives)
 - Hypothermia
- Severe, potentially life-threatening signs
 - Shortness of breath, respiratory distress
 - Hypotension or hypertension
 - Loss of consciousness
 - Flank or back pain
 - Hemoglobinuria
 - Oliguria/anuria

If a reaction is suspected (Tobian, 2024):

- **STOP the transfusion immediately.**
- Maintain a patent intravenous line.
- Inform the transfusion service.
- Confirm the correct product was initiated.
- Assess the patient.
- Determine type of reaction and treat as appropriate.

Types of Transfusion Reactions (Tobian, 2024)

Transfusion Reactions		
Life-threatening reactions		
Type of reaction	Description	Treatment
Transfusion-associated circulatory overload (TACO)	<ul style="list-style-type: none"> • Pulmonary edema due to volume excess or circulatory overload • Hypertension may be present • Occurs during transfusion or within 12 hours of transfusion completion 	<ul style="list-style-type: none"> • Diuresis • Supplemental oxygen • Ventilatory support if severe
Transfusion-related acute lung injury (TRALI)	<ul style="list-style-type: none"> • Fever, chills • Respiratory distress • Rales on auscultation 	<ul style="list-style-type: none"> • May require intubation and mechanical ventilation

	<ul style="list-style-type: none"> • Hypoxemia • Hypotension • Bilateral pulmonary edema on chest x-ray • Occurs during transfusion or within 6 hours of transfusion completion 	
Acute hemolytic transfusion reaction (AHTR)	<ul style="list-style-type: none"> • Caused by acute intravascular hemolysis of transfused RBCs that may be due to ABO incompatibility • Fever, chills • Flank/back pain • Oozing from IV site • Hypotension • Occurs during transfusion or within 24 hours of transfusion completion 	<ul style="list-style-type: none"> • Aggressive hydration • Diuresis
Transfusion-associated sepsis (bacterial infection)	<ul style="list-style-type: none"> • Caused by transfusion of a product that contains bacteria • Fever, chills • Hypotension (and other signs of shock) • Occurs during transfusion or within 72 hours of transfusion completion 	<ul style="list-style-type: none"> • Broad-spectrum antibiotics • Hemodynamic support
Anaphylactic transfusion reaction	<ul style="list-style-type: none"> • Severe allergic reaction possibly due to IgA antibodies • Angioedema, wheezing, and/or hypotension • Occurs during transfusion or within 4 hours of transfusion completion 	<ul style="list-style-type: none"> • Epinephrine • Antihistamines • Vasopressors
Non-life-threatening reactions		
Type of reaction	Description/signs & symptoms	Treatment
Allergic transfusion reaction (ATR)	<ul style="list-style-type: none"> • Caused by antigen-antibody reaction between patient and product • Itching and hives • Occurs during transfusion or within 4 hours of transfusion completion 	<ul style="list-style-type: none"> • Antihistamines (e.g., diphenhydramine) for treatment but not prophylaxis • Transfusion may be continued if no other symptoms develop
Febrile non-hemolytic transfusion reaction (FNHTR)	<ul style="list-style-type: none"> • Most common reaction caused by a release of cytokines from WBCs • Fever, chills, and/or rigors without other systemic symptoms 	<ul style="list-style-type: none"> • Antipyretics (e.g., acetaminophen) for fever • Meperidine for severe chills or rigors

	<ul style="list-style-type: none"> Occurs during transfusion or within 4 hours of transfusion completion 	
Hypotensive transfusion reaction	<ul style="list-style-type: none"> Drop in blood pressure (BP) without other causes Systolic BP decreases by 30 mm Hg or more and may drop to less than 80 mm Hg within one hour Usually occurs within the first 10 to 15 minutes of transfusion initiation 	<ul style="list-style-type: none"> BP typically returns to baseline once the transfusion is stopped. Usually does not require specific treatment or prevention, except avoiding ACE inhibitors prior to transfusion or apheresis.

Initial Laboratory Testing

The provider should discuss with the transfusion/blood bank personnel whether laboratory testing should be ordered. Minor allergic reactions (e.g., hives) and TACO may not require laboratory tests. All patients with suspected AHTR, anaphylaxis, sepsis, and TRALI should have labs drawn or other tests (e.g., chest radiography) to determine the cause of the patient's symptoms.

If ordered, a blood sample should be sent to the lab with the following information:

- Patient identifying information
- Underlying diagnosis and reason for transfusion
- Recent fever course
- Previous transfusion reactions
- Administration of any pre-transfusion medications or new medications that could have caused an allergic reaction or drug-induced hemolysis
- Time the transfusion was initiated
- Time symptoms began
- Time the transfusion was stopped
- Patient symptoms
- Patient vital signs

The blood bank or laboratory will perform the following:

- Verify the component container, label, paperwork, and patient sample used for typing and cross-matching
- Repeat ABO testing on the post-transfusion patient sample
- Visual check of pre- and post-transfusion patient samples for signs of hemolysis
- Direct antiglobulin (Coombs) test (DAT) on post-transfusion patient sample
- Antibody screen

Restarting the Transfusion after a Reaction

If the symptoms clear and the correct product has been verified by the transfusion service, the treating provider (and transfusion service) should decide if the transfusion may continue.

- Transfusion of the original product shouldn't be continued if the suspected reaction was AHRT, anaphylaxis, sepsis, or TRALI.
- Transfusion of the same product may be continued if it was a minor allergic reaction or TACO that has resolved with diuresis or other treatments. If 4 hours has passed, the product should not be used.

References

American Red Cross (n.d.). Facts About Blood and Blood Types. Retrieved on June 20, 2024 from <https://www.redcrossblood.org/donate-blood/blood-types.html>

Lippincott Solutions. (2023, August 21). Blood and blood product transfusion. Lippincott, Williams and Wilkins. <https://procedures.lww.com/lnp/view.do?pld=858342&hits=transfuse,transfusion,blood,transfused,transfusing,transfusions&ad=false&q=blood%20transfusion>

Tobian, A. (2024, May 6). Approach to the patient with a suspected acute transfusion reaction. *UpToDate*. <https://www.uptodate.com/contents/approach-to-the-patient-with-a-suspected-acute-transfusion-reaction>