ER BASICS · ONE-PAGER

Blood Products and Transfusion

Components, triggers, compatibility, reactions, massive transfusion, reversal

30 sources + more detail
erbasics.com/sheets/blood-products.html
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PRODUCTS What is in the bag, and what one dose does



1 Products at a glance

PRODUCT	CONTAINS / EFFECT	TYPICAL USE
PRBCs	1 unit raises Hgb about 1 g/dL	Symptomatic anemia, hemorrhage
Plasma (FFP)	All clotting factors; 10 to 15 mL/kg	Bleeding with many factors low, massive transfusion, TTP
Platelets	1 apheresis unit raises count 30,000 to 60,000/µL	Low count or dysfunction with bleeding or procedures
Cryo	Fibrinogen, factors VIII and XIII, vWF	Bleeding with fibrinogen below 100 to 150 mg/dL
Albumin 5% or 25%	Protein; no clotting factors	Volume; 25% after paracentesis over 5 L
4F-PCC	Factors II, VII, IX, X; proteins C and S	Fast warfarin reversal, small volume

Plasma is not for volume or an INR of 1.7 or less.

2 When to transfuse

- Stable hospitalized adults: RBCs below Hgb 7 g/dL (AABB 2023)
- Cardiac surgery: below 7.5. Orthopedic surgery or existing heart disease: below 8
- Acute MI: below 10 (AABB 2025, conditional)
- Active bleeding or shock: treat the patient, not the number
- Platelets (AABB/ICTMG 2025): below 10,000 chemo prophylaxis or compressible CVC; 20,000 LP; 50,000 major non-neuraxial surgery
- Avoid platelets in HIT, TTP or ITP unless bleeding is life-threatening

EXAM TIP Exams default to 7, or 8 with heart disease. The AMI threshold of 10 is newer.

3 Compatibility

PRODUCT	WHAT MUST MATCH	EMERGENCY CHOICE
RBCs	ABO and Rh; crossmatch	O negative; often O positive for males and older women
Plasma	ABO only, the reverse of RBCs	AB (universal donor); in practice often group A
Platelets	No crossmatch; ABO compatible preferred	Rh-negative patients: Rh negative if available, especially women of childbearing age
Cryo	No compatibility testing	Any group

4 Giving blood safely

1. Confirm order, consent and baseline vital signs
2. Bedside check per policy: two identifiers, unit number, ABO/Rh, expiration
3. Blood set with a 150 to 260 micron filter, saline primed
4. Start slowly; stay close for 15 minutes, then recheck vitals
5. Finish within 4 hours of spiking the bag
6. Warmer for rapid or massive transfusion

SAFETY Only 0.9% sodium chloride or an FDA-approved blood-compatible fluid (such as Plasma-Lyte A). Never Lactated Ringer's (calcium clots citrated blood), dextrose or medications.

NCLEX-PN tests monitoring transfusions; LPN/LVN roles in starting one vary by state and facility.

5 Transfusion reactions

SAFETY Suspected reaction: stop the transfusion, keep saline running via new tubing, notify the provider and blood bank, return the bag and tubing.

REACTION	CLUES	KEY ACTION
Acute hemolytic	Fever, back pain, low BP, dark urine, oozing; usually an ID error	Send labs and bag; support BP and urine output
Delayed hemolytic	2 to 14 days later: fever, falling Hgb, positive DAT	Report; usually mild
Febrile	Temp up 1°C or more, or chills, within 4 h	Rule out hemolysis and sepsis; antipyretic
Mild allergic	Hives or itching only	Antihistamine; resume only per protocol
Anaphylaxis	Low BP, wheeze, angioedema; exam link IgA deficiency (most unexplained)	Epinephrine, airway, fluids
TRALI	Hypoxemia, bilateral infiltrates within 6 h	Oxygen or ventilation
TACO	Dyspnea, high BP, JVD, crackles within 12 h	Upright, oxygen, diuretic
Septic	Fever up 2°C or more, rigors, low BP; often platelets	Culture patient and bag; antibiotics

EXAM TIP TACO or TRALI? TACO: high BP and BNP; diuretics help. TRALI: may bring fever and low BP; diuretics do not help.

6 Massive transfusion

- Often 10 or more RBC or whole blood units in 24 hours
- 1:1:1 plasma, platelets, RBCs: better hemostasis, fewer early bleeding deaths (PROPPR)
- Citrate binds calcium (long QTc, tetany, paresthesias): check ionized calcium
- Military: 1 g calcium (10 mL 10% chloride or 30 mL 10% gluconate) with the first unit, then every 4 units; gluconate is safer peripherally
- Prevent hypothermia, acidosis and coagulopathy; watch potassium
- TXA (CRASH-2): 1 g IV over 10 min, then 1 g over 8 h, within 3 h of injury. Military guidance: one 2 g bolus

EXAM TIP TXA timing is testable: benefit was greatest within 1 hour; starting after 3 hours raised bleeding deaths.

Typical adult doses for exam study; follow your institution's or agency's protocols.

7 Anticoagulant reversal

DRUG	REVERSAL	KEY POINT
Warfarin	4F-PCC 25 to 50 units/kg by INR, plus vitamin K 5 to 10 mg slow IV	PCC corrects INR in about 30 min; vitamin K takes hours
Dabigatran	Idarucizumab 5 g IV	Antibody fragment that binds dabigatran
Apixaban, rivaroxaban	4F-PCC, off-label (ACC 2020: 2,000 units)	Andexanet withdrawn in the US, Dec 2025

SAFETY IV vitamin K no faster than 1 mg/min (anaphylaxis). PCC carries thrombosis risk and contains heparin: avoid in HIT.

Typical adult doses for exam study; follow your institution's protocols.

MORE Oxygen delivery, hemostasis and stored blood

Red cells restore oxygen delivery: DO_2 = cardiac output × CaO_2 × 10, with $CaO_2 = (1.34 \times Hgb \times SaO_2) + (0.003 \times PaO_2)$. At Hgb 15 g/dL, SaO_2 98% and cardiac output 5 L/min, DO_2 is about 1,000 mL/min against a resting VO_2 of 250 mL/min, an extraction of 25%. Anemia is tolerated by raising cardiac output and extraction: resting volunteers hemodiluted to Hgb 5 g/dL had no rise in lactate (Weiskopf, JAMA 1998). The heart already extracts 70–75% at rest and can meet more demand only with more coronary flow, which a stenosis limits, so thresholds are higher in coronary disease.

Over up to 42 days of storage at 1–6 °C, 2,3-DPG falls (shifting the curve left until it regenerates), potassium leaks out, faster after irradiation, and the cells stiffen. Fresher units showed no benefit in ABLE, RECESS, INFORM and TRANSFUSE (2015–2017), so banks issue the oldest compatible unit first.

Hemostasis fails in order: with red cell and crystalloid or colloid replacement, fibrinogen reaches a critical 100 mg/dL after about 142% of blood volume is lost, platelets 50,000/µL only at about 230% (Hiippala 1995). Hypothermia (about 10% loss of clotting function per 1 °C), acidosis and hypocalcemia worsen it, and PT and aPTT miss hypothermia and hypocalcemia because they run at 37 °C on recalcified plasma (European trauma guideline 2023).

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