

PLATELET PRODUCTS

Shan Yuan, MD

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Summary: Comparison of Platelet Concentrates and Apheresis Platelets

<i>Platelet Concentrates (PC)</i>	<i>Apheresis Platelets</i>
Made from WB 5.5×10^{10} in 45-65 ml plasma A pool of 6 (4-10) = 1 dose for an adult Leukoreduce each unit with filter post collection	Collected by apheresis instruments 3×10^{11} in ~200 ml One unit is 1 dose for an adult Leukoreduced during collection
Multiple donor exposure per dose.	Single donor- can collect HLA-matched or crossmatched platelets from a single donor.

Platelet Concentrate(PC)

Product Description:

- Volume: 45 – 65 ml/unit
- Contents:
 - Platelets ($\geq 5.5 \times 10^{10}$ in 90% tested per AABB Standards)
 - Suspended in ~50ml volume of plasma
 - a small amount of RBCs (< 0.5ml per unit) and WBCs.
 - **pH ≥ 6.2** per Standards.
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Preparation:

- Collected, unrefrigerated whole blood is centrifuged at low speed (soft spin) to separate platelet rich plasma (PRP).
- PRP is subjected to another centrifugation (hard spin), then all but 50-60ml of supernatant plasma is removed. Removed plasma can be used to make plasma products.
- Platelet pellet resuspended in residual plasma.

Storage:

- Store at room temp (20-24C) with continuous gentle agitation.
- Shelf life: up to 5 days after collection
- May go up to 24 hour without agitation.
- Outdates in 4 hours after pooling or washing/volume reduction (i.e., whenever an “open system” is created)

Dose and response:

- In an average adult: PCs are usually administered in pools of 6 units; one PC should increase the platelet count by 5,000 – 10,000 / μ L (a pool of PCs should increase the platelet count by 30,000 – 50,000 / μ L).
- An adequate response and/or need for further therapy should be guided by comparing the pre-transfusion platelet count to a platelet count measured within 1 hour of the completion of transfusion
- In an infant: 10-15ml/kg should achieve an increment of 50,000 – 100,000 / μ L
- Causes for an inadequate response to platelets include:
 - Immune mediated: Destruction of transfused platelet by anti-HLA alloantibodies most commonly, but also platelet auto- or alloantibodies
 - Non immune causes: DIC, ongoing bleeding, fever, infection, splenomegaly, many medications (Amphotericin B best known)

Apheresis Platelet Products

Description:

- Volume: 200ml per unit
- Contents:
 - Platelets ($\geq 3.0 \times 10^{11}$ in 90% single units tested per AABB Standards)
 - Suspended in ~200 ml of plasma
 - Minimal amount of RBCs/WBCs.
 - pH ≥ 6.2 per Standards.

Preparation

- Collected with apheresis instrument, which selectively remove platelets and the plasma that they are suspended in. RBCs returned to the donor.
- Each product is collected from a single donor (therefore aka single donor platelets)
- Depending on donor size and platelet count, double or triple units can also be collected in one procedure.
- Leukoreduction/filtration accomplished during Collection

Storage, Indications, and Shelf Life: Same as platelet concentrates.

Dose response:

- Transfusion of an average unit of apheresis platelets in an average adult: should increase the platelet count by 30,000– 50,000/ μ L (similar to a pool of 4-6 PCs).

ABO Compatibility in Platelet Transfusion

- ABO antigens are expressed on platelet but variably and weakly. May give ABO incompatible platelets due to inventory issues.
- Data suggest that ABO compatible platelet transfusion in general results in post-transfusion increments that are 25-30% higher. However, whether this clinically significant is debatable

- In some recipients, poor response to platelet transfusion sometimes occurs due to faster clearance of ABO incompatible donor platelets; then it is not unreasonable to try ABO compatible platelets to see if response improves
- Acute hemolytic transfusion reactions can also occasionally occur when platelets from a group O donor with high anti-A titer are given to an A recipient. Some centers have proposed either screening O platelets for high-titers of anti-A antibodies, or limiting exposure to O platelets in group A recipients.
- Due to the small blood volume of neonates, exposure to ABO incompatible plasma should be minimized – use ABO compatible platelets only, or volume-reduce the plasma of non-ABO compatible platelets.

Rh Compatibility in Platelet Transfusion

- Rh antigens are not present on platelets. They are expressed on RBCs
- But platelet products may contain some contaminating RBCs with Rh antigens (In general, platelet concentrates have <0.5ml RBCs, apheresis platelets have far less)
- Alloimmunization to the Rh(D) antigen due to such a small amount of RBC occurs only rarely, so many places only try to give Rh compatible platelet products to female recipients
- If due to inventory constraints, Rh positive platelet products are given to younger females (not past reproductive age), consider prophylaxis with Rhogam. Each full dose should cover exposure of ~15 ml RBCs

The Issue of Platelet Sterility

- Bacterial contamination is now the #1 transfusion infection risk, and a top cause of transfusion-related mortality
- Since 2004, *AABB Standards* has required that blood banks have methods to both *limit* and *detect* bacterial contamination of both apheresis platelets and platelet concentrate)
- Approaches of limiting contamination include:
 - Careful skin preparation
 - Discarding the initial 20-30 cc of blood collected, which is often contaminated with skin flora
 - Exclusive use of apheresis platelets to reduce donor exposure
- Approaches of detecting contamination:
 - Culture-based methods: Bacterial Detection System (Pall), BacT/ALERT (BioMerieux, Inc). Can be done with apheresis platelet by taking a 10-15ml sample 24 hours after collection. Platelets are quarantined until culture is negative at 12hr or more. (*Note: This increases the time that products are in quarantine and introduces some inventory challenges*)
 - Dipstick check of pH changes and glucose changes. Platelet concentrates may be monitored with dipsticks – which adds a lot of process time before release. The test also has poor sensitivity and specificity
 - Gram Stain – labor intensive, not practical

- Verax: Point-of-care testing kit, recently cleared by the FDA as a bacterial detection test for pooled platelet concentrates. Test detects lipoteichoic acids on Gram-positive bacteria and lipopolysaccharides on Gram-negative bacteria.

Summary of Indications for Platelet Transfusion

- Prophylaxis in non-bleeding patients with counts of $< 10,000 - 20,000 /\mu\text{L}$
- Patients with counts $< 50,000 /\mu\text{L}$ who are actively bleeding or are preparing to undergo an invasive surgical procedure
- Patients with counts $< 100,000 /\mu\text{L}$ who are bleeding in cardiopulmonary bypass surgery, neurosurgery, ophthalmic surgery.
- Treatment of patients with congenital or acquired platelet function defect and bleeding, (e.g. drug induced by aspirin, ticlopidine, Abciximab) regardless of patient's platelet count
- Patients on cardiac bypass machine or ECMO and platelet count $< 100,000 /\mu\text{L}$