PLATELET PRODUCTS
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Summary: Comparison of Platelet Concentrates and Apheresis Platelets

<table>
<thead>
<tr>
<th>Platelet Concentrates (PC)</th>
<th>Apheresis Platelets</th>
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<tr>
<td>Made from WB 5.5x10^10 10 in 45-65 ml plasma</td>
<td>Collected by apheresis instruments 3x10^11 in ~200 ml</td>
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<tr>
<td>A pool of 6 (4-10) = 1 dose for an adult</td>
<td>One unit is 1 dose for an adult</td>
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<td>Leukoreduce each unit with filter post collection</td>
<td>Leukoreduced during collection</td>
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<td>Multiple donor exposure per dose.</td>
<td>Single donor- can collect HLA-matched or crossmatched platelets from a single donor.</td>
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Platelet Concentrate (PC)

Product Description:
- Volume: 45 – 65 ml/unit
- Contents:
  - Platelets (>5.5 x 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.
- 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 /µL (a pool of PCs should increase the platelet count by 30,000 – 50,000 /µL).

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 /µL.

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 Platlet Products

Description:
- Volume: 200ml per unit
- Contents:
  - Platelets ($3.0 \times 10^{11}$ 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/µL (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 anit-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 /µL
- Patients with counts < 50,000 /µL who are actively bleeding or are preparing to undergo an invasive surgical procedure
- Patients with counts <100,000 /µL 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 /µL