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CALIFORNIA BLOOD BANK SOCIETY

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Washed and volume-reduced Plateletpheresis units

A blood banker wrote that his facility recently had an order for a washed and volume-reduced Plateletpheresis unit to be given to a **newborn**. The inquiring blood banker would like to know if others have had similar orders. If so, what criteria have been established for accepting such orders? In other words:

- When is this a **rational** order?
- What is considered the **maximum expiration time** on a volume reduced/washed Plateletpheresis unit?

The following replies were submitted in response to the above:

1. **A New York blood banker** commented that "To my mind volume-reduced plateletpheresis products almost **never make sense**. That's why they call the product "platelet concentrate." If one does the calculations, transfusing a unit or part of a unit of random donor platelets with a platelet count of 1,000,000-1,500,000/ μ l (typical counts) to a newborn with a blood volume of 100 ml/kg, it doesn't take too many milliliters of platelet concentrate (usually about 10 ml) to raise a 2 kg newborn's platelet count by 50,000-75,000, which is almost always in excess of what is needed.; A premature newborn would need even less volume, perhaps 5 ml. So what is the point of concentrating a product that already is concentrated? One doesn't want to be raising these infants' counts by 100,000-200,000/ μ l. Administering 5-10 ml of fluid is no big deal in almost all cases. So concentrating platelets is usually, almost always, an unnecessary approach and we rarely do it except to appease stubborn or otherwise refractory clinicians about once every five to ten years rather than upset them if they don't listen to our initial rational discourse. Washing platelets is another story. We don't like to administer ABO-mismatched plasma to patients getting multiple transfusions, so we occasionally use washed platelets in newborns for this reason (e.g., the baby is group AB and we only have O and A platelets). Patients with repeated febrile and/or allergic reactions to leukoreduced platelets also respond very well to washed platelets in our experience (Transfusion Medicine 11:45-47, 2001). I think the likelihood of bacterial contamination during processing is remote, but we use a **four-hour outdate** after washing, similar to that after pooling of random donor platelets.
2. **A Boston blood banker** wrote: "We **discourage requests** for volume-reduced platelets out of concern for the safety of the baby recipient. Given that the recipient's platelet count is likely to be <100,000/uL and given that a routine platelet product has a platelet concentration of ~1,000,000/uL, the standard platelet product is already ten-fold concentrated relative to the recipient. Other products (RBCs, FFP) are far less concentrated relative to the patient (RBCs about 3 fold; FFP perhaps 4 fold). Thus, the rationale for further concentrating platelets (which are already a concentrate) makes little physiologic sense. In addition, further concentration of platelets has two consequences of **risk** to the recipient: **first**, platelet centrifugation results in activation of platelets which may result in either the infusion of activated platelets or (if delays occurs from centrifugation to administration) may result in the infusion of "spent" platelets. **Second**, further concentration of platelets produces aggregates which could behave as microemboli to the neonatal capillary bed (pulmonary bed if products are given i.v. in the usual way... or cerebral bed if products are given on the arterial side). Finally, the decision to infuse an unphysiologically concentrated number of centrifuged platelets must be weighed in light of the fact that nearly all requests for platelet transfusion for neonates are NOT to address clinical bleeding but are given under an assumption of prevention of bleeding risk, an assumption not supported by clinical trials."
3. **A Texas blood banker** commented that at her facility that usually have one or two patients a year where the mother has platelet antibodies and the baby needs platelet transfusion. A plateletpheresis is performed on the mother, and the donated platelets are leukocyte-reduced, irradiated and washed. The expiration time is 4 hours after washing the product.
4. **A blood banker in Palo Alto** (near a prestigious university medical center) says: "Our transfusion service has a sliding scale that defines the amount of incompatible plasma that can be given with

any one transfusion episode. The volumes were chosen to represent approximately 5 ml/kg or 10% of the recipient's plasma volume. If we must give a platelet that contains incompatible plasma, we pack it (volume reduce it) so that the amount of incompatible plasma will be less than 5 ml/kg or 10% of the patient's plasma volume. For example, in the case of a 3 kg newborn with a blood volume of approximately 300 ml, the maximum amount of incompatible plasma that we would infuse would be about 15 ml. If we must give platelets with incompatible plasma to a baby in our nursery, we take one whole blood-derived platelet concentrate and volume-reduce it to 10-15 ml, then infuse it. We do not wash it because we lose too many platelets when we try to wash them and volume reduction is sufficient from a clinical perspective. **The expiration time on a manipulated platelet is 4 hours** from the time the product is first entered. Besides the issue of incompatible plasma, the other issue raised by this question is what the appropriate platelet dose is for a newborn. The usual platelet dose for a pediatric patient is one unit-equivalent per 10 kg body weight. Thus, the appropriate dose of platelets for a newborn is one whole-blood derived platelet, not one pheresis platelet. Pheresis platelets are usually considered to be equivalent to 6 unit-equivalents; this is an inappropriately large dose of platelets for a newborn."

5. **Another California blood banker, in the Davis (Sacramento) area** said that "We are a 400-bed medical center and we occasionally give volume-reduced or albumin-resuspended platelets to neonates or pediatric patients. The following are our basic criteria:

- Volume overload in the patient
- ABO-incompatible plasma (>20% of patient plasma volume)
- T-activation (usually with incompatible minor crossmatch)

We treat these cases as opened system platelets and they therefore have a **storage life of only 4 hours**. Careful coordination with the clinical staff is required."

6. **A blood banker, who helps write the AABB Standards**, commented that in his opinion, "the one time this request is rational is if you have no AB platelet concentrates and you have an AB tiny tot. That said, since the goal is typically to achieve a post-transfusion increment to yield a platelet count above 100K and this is almost always achievable by simply transfusing 10-15 cc/kg of **platelet-rich plasma**, there is little reason to concentrate the platelets. See p. 329 of Ron Strauss' Neonatal Transfusion Chapter in Anderson's Scientific Basis of Transfusion Medicine, 2nd ed., 2000." Routinely reducing the volume of platelet concentrates by additional centrifugation steps is neither necessary nor wise".

7. **A blood banker in Texas** says that "I work at both a blood center and a hospital, so this is my opinion, rather than institutional policy. But I think **it is appropriate to wash/volume reduce for the setting of neonatal alloimmune thrombocytopenia when you are using platelets from the mother to transfuse to the baby**. Also if you urgently need platelets and there are no alternative products for an **IgA-deficient patient** with a history of transfusion reactions or a patient with documented T activation. Also we have occasionally done it for a patient with repeated severe allergic reactions who must have a platelet infusion and IgA deficiency has been ruled out. If volume reduction is ordered only for volume constraints in a baby, I try to encourage the clinicians to use one unit, non-centrifuged, rather than a pool of 2 or 3 with volume reduction (which is what they tend to order). As far as expiration time, we have always made it **a four-hour expiration** from the time you first enter the bag."

8. **A blood banker in Michigan** said that "Until recently our Blood Bank received periodic orders for volume reduction of random donor platelets in supernatant plasma for thrombocytopenic neonates. Neonatologists would order these products when wanting to achieve the transfusion of the largest numbers of platelets in neonates whom they considered to be volume sensitive. We were requested to provide products reduced to 10 ml or less in a syringe. Thinking that this was not a proven practice, we took this issue to the Transfusion Committee and the Department of Neonatology. Our concerns centered on the following:

There was no published literature or evidence-based medicine that conclusively showed that this practice was of clinical benefit. We were concerned about possible bacterial contamination of these products in an open system we did not know about the potential detrimental effects of suspending large numbers of platelets in relatively small supernatant plasma volumes, e.g., would the pH would become highly acidic as large numbers of platelets incubated at room temperature and/or would they become activated in a hyperconcentrated environment?

We conjointly decided that we would continue this practice only after the Neonatologist had consulted with the Medical Director of the Blood Bank. A 15-20 ml product would be provided in a syringe that would be picked up and transfused within 90 minutes of preparation. Over the last 8 months we have received no further orders for these products. Similar procedures using a plateletpheresis product, in our opinion, would only complicate the above mentioned concerns. Since our Blood Bank has received no requests concerning volume-reduced and washed platelets, we cannot comment on this type of preparation."

9. **A blood banker who has extensive experience with pediatric transfusion therapy** indicated that when a plateletpheresis unit has been obtained from a mother for treatment of **neonatal alloimmune thrombocytopenia** of her infant, (and the infant is at risk for intracranial or major organ hemorrhage), **one can split the donated platelets into two aliquots** and wash **one half at a time**, so that the infant can get two transfusions from the donated unit of plateletpheresis.
10. **A blood banker in Texas** wrote that she agrees with several of the people who wrote to say they were concerned about the size of the dose of platelets when transfusing a neonate with a unit of plateletpheresis. According to the Texan, **a plateletpheresis unit has too many platelets in it to give the whole product to a neonate**, regardless of how much the volume is reduced. At her facility, her Medical Director will speak with the physician ordering the product and tell him/her that the most current recommendation is to use one leukoreduced random platelet. If a volume reduced platelet transfusion must be administered, an approved SOP is followed including a 4 hour outdate. They issue the platelets in a syringe that has a filter in tubing affixed to it so that as the syringe is filled the platelets go through a 150 micron filter and then can be put through a syringe pump for transfusion. The responding blood banker refers to a lecture about pediatric transfusion therapy presented by R. Yomtovian from the University Hospitals of Cleveland and Case Western Reserve University, Cleveland, OH which she says was presented at the 28th Annual Topics in Blood Banking at the University of Michigan on June 7-8, 2001. In several of the case histories presented, overtransfusion of platelets had dire consequences. There is an article in JAMA 2001;285:2114-2120 about medication errors in pediatrics, and most were dosing errors. The responding blood banker believes that transfusion medicine physicians and the blood bank technologists have a responsibility to educate the physician ordering the product if it could be harmful or is unnecessary.



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Posted: October 25, 2001

Addenda: Oct. 25 & 27, 2001



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ADDENDA Oct. 27, 2001

11. One excerpt that is pertinent from the AABB's Collected Questions and Answers, 7th edition, pg 40-41 is as follows:

QUESTION:

"A new pediatric hematologist physician has joined our hospital staff and insists on transfusing only platelets that are volume-reduced. Our Blood Bank staff, including our Medical Director, feel that volume-reduced platelets would only be warranted if the platelet unit contains plasma incompatible with the infant's ABO type. Since we only transfuse ABO/Rh type-specific platelets to infants, we think volume reduction is not only unnecessary, but reduced-volume platelets have decreased viability/efficacy. We suggest that if volume-overload is a concern, that they transfuse a smaller volume of platelet concentrate vs. volume-reduced. Does the physician have a valid reason for requesting volume-reduced platelets? "

RESPONSE:

"Few facilities routinely volume reduce platelets for neonatal patients when unable to obtain ABO-specific platelets. Neonates generally require a portion of an apheresis platelet or less than one unit of a platelet concentrate. According to McCullough, the volume of a platelet transfusion should be based on the size of the infant and the infant's platelet count. Examples of dosing strategies include:

- 1 unit of platelets per 10 kg of body weight
- 4 units of platelets per square meter of body surface area
- 10 mL of platelets per kg of body weight.

In most cases, a relatively small volume of platelets would be expected to adequately raise the platelet count. For example, given a 4 kg infant with a blood volume of 320 mL (80 mL/kg) with a hematocrit (Hct) of 50%, the plasma volume would be: $\text{Blood volume} \times (1 - \text{Hct}) = 320 \times (1 - 0.50) = 160 \text{ mL}$. If a routine platelet contains 3×10^{11} platelets in 200 mL of plasma (an apheresis platelet). This would result in 1.5×10^9 platelets per mL. If one allowed for a 50% in-vivo recovery of infused platelets one can calculate that relatively small volumes of platelets would result in substantial platelet increments. Thus, even small volumes such as 20 or 40 mL relative to the child's blood volume would result in substantial increments in the platelet count. Such arguments have been used as justification for not volume-reducing ABO identical platelets in this setting. (Reference: McCullough, J. Transfusion Medicine. McGraw-Hill, 1998, p.296)

12. **A blood banker at Children's Hospital of Philadelphia** comments that they occasionally receive requests for volume-reduced platelets. All orders of this type must be approved by the Blood Bank Medical Director. Typically they prepare this product for patients who are very sensitive to additional fluids. They give these products a four-hour expiration date. The medical director and the ordering physician decide on the final volume, usually they will take a 1/4 of a unit down to 20-25 ml. They might do this once or twice a year. According to the responding blood banker, they do not wash platelets. They do remove the plasma and resuspend the platelets in saline if the donor is incompatible with the recipient. They give saline-suspended platelets a four-hour expiration date from the time they start to prepare the product.
13. **A blood banker at Children's Hospital in Denver** comments that one approach is to split a unit of platelets and transfuse the aliquots several hours apart to mitigate fluid overload. A sterile connection device makes this approach quite manageable. Her center routinely aliquots pheresis platelets for babies in this very manner.
14. **A blood banker at Yale** would like to respond to the "blood banker in Michigan" ([reply #8](#)) about the lack of data that "There was no published literature or evidence-based medicine that conclusively showed that this practice was of clinical benefit" The Yale blood banker offers the following references:

- [Pisciotta PT, Snyder EL, Napychank PA, Hopfer SM](#). In vitro characteristics of volume-reduced

platelet concentrate stored in syringes. Transfusion 1991;31:404-8

- Pisciotta PT, Snyder EL, Snyder JA, Frattaroli S, Hopfer SM, Rinder HM, Smith BR. In vitro characteristics of white cell-reduced single unit platelet concentrates stored in syringes. Transfusion 1994;34:407-11.



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