Securing supply of HPA-1a negative platelet concentrates for FNAIT patients

Young-Lan Song[1], Pascal Weisser[3], Gabriella Rizzi[1], Nadine Trost[2], Goslings David[3], Yvonne Merki[2], Beat M. Frey[1], Christoph Gassner[4], Stefan Meyer[2&], Charlotte Engström[1&]

[1]Immunohematology, Blood Transfusion Service Zurich, Swiss Red Cross, Switzerland
[2]Molecular Diagnostics and Cytometry, Blood Transfusion Service Zurich, Swiss Red Cross, Switzerland
[3]Manufacturing Site, Blood Transfusion Service Zurich, Swiss Red Cross, Switzerland
[4]Private University in the Principality of Liechtenstein, Triesen, Liechtenstein

[&]equally contributing authors

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Background

Fetal/neonatal alloimmune thrombocytopenia (FNAIT) caused by maternal antibodies against human platelet antigens (HPA) - mostly anti-HPA-1a, followed by anti-HPA-5b - may lead to in intracranial hemorrhage (ICH). FNAIT itself is a rare condition (1-2/1,000) with risk of ICH in 1/10,000 live births.
In case of NAIT, immediate HPA negative platelet transfusion is recommended.
Hence, we implemented a strategy including donor identification and product logistics securing supply of HPA-1a negative platelets.

Methods

High throughput genotyping of blood donors' HPA-1 and HPA-5 status is performed by MALDI-TOF mass spectrometry implemented in 2015 as a routine-oriented tool for screening of red blood cell and platelet antigens. HPA-1a negative platelet units are labeled accordingly and kept in stock until replaced by a fresh product or day of expiry. With respect to HPA-1a negative units supply was retrospectively evaluated over a period of 11 months by statistical analyses using R. To test whether adaptations can fill noted supply gaps, this period was simulated with different combinations of the variables donation frequency, production and release dates. A strict retention policy, 7d shelf-life, and public holidays were also taken into account.

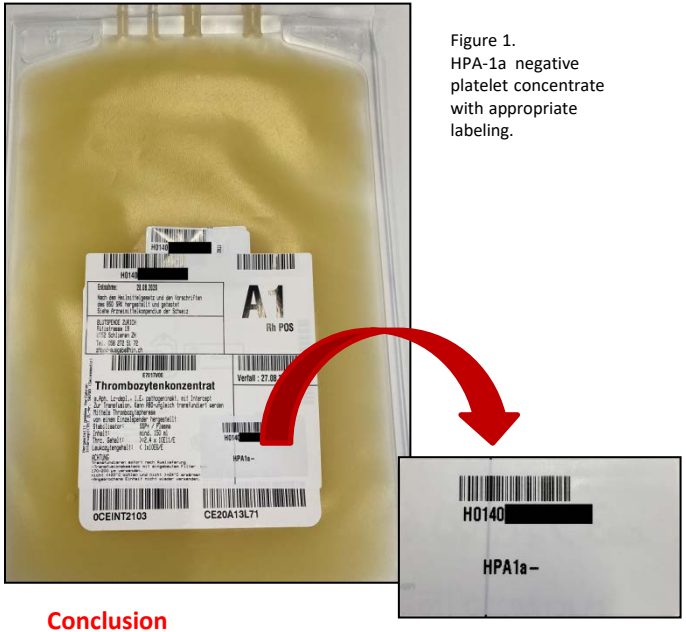

Figure 1.
HPA-1a negative platelet concentrate with appropriate labeling.

Results

Since 2015 more than 30,000 blood donors have been genotyped for HPA-1 (allele frequency HPA-1b: 0.150) and HPA-5 (HPA-5b: 0.094). Among a total of 694 HPA-1a negative blood donors, 61 active platelet apheresis donors with a minimum of at least one donation within the last 2 years could be identified. Retrospective analysis of our random recruitment strategy revealed a 85% probability in 2019 of being able to deliver instantly.

Simulations considering strict compliance with all parameters, in particular retention policy, confirmed the lack of supply with the current strategy. To improve coverage rate, rare HPA-1a negative donors are now scheduled on two defined days per week as calculated from our statistical analysis.

Conclusion

On an annual basis, four to five HPA-1a negative platelet units need to be provided by our institution. So far, delivery could be warranted within a maximum of two days. Our recently implemented systematic recruitment strategy along with our high proportion of genotyped donors now allows to fulfill even emergency requests. Our strategy envisions for a nationwide Swiss supply with HPA-1a negative platelets at any time.
Subsequently, our regular platelet donors will be tested for HPA-2, -3, -4 and 15 in order to meet special requirements.