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Red blood cell sedimentation of Apheresis Granulocytes

Michelle A Lodermeier, Karen M Byrne, and Willy A Flegel

Department of Transfusion Medicine, NIH Clinical Center, National Institutes of Health, Bethesda, MD 20892-1184, U.S.A

Sedimentation of Apheresis Granulocytes removes red blood cells. It is used to increase the blood donor pool when blood group compatible donors cannot be recruited for a patient, because of a major ABO incompatibility or incompatible red cell allo-antibodies in the recipient. Since granulocytes have little ABO and few other red cell antigens on their membrane, such incompatibility lies mostly with the contaminating red blood cells. The Video Clip S1 shows the process of red cell sedimentation of an Apheresis Granulocyte component. This video was filmed with a single smart phone, attached to a commercial tripod, and edited on a tablet computer with free software by an amateur videographer without prior video experience.

The component in this video was collected by apheresis (Cobe Spectra, Terumo BCT, Lakewood, CO) as an unlicensed product in accordance with Food and Drug Administration (FDA) guidelines. The recruited donor had normal screening assay results within 30 days of the donation. Dexamethasone and G-CSF (Filgrastim; Amgen, Thousand Oaks, CA) was administered to the donor 12 hours prior to collection. This helped to increase the harvest yield to 3.67×10^{10} granulocytes, thus exceeding the AABB Standards requirement of 1.0×10^{10} (1).

After collection of the component, ABO/Rh typing and an isohemagglutinin titer was tested on the donor sample and the manufacturing process was initiated. In our case the donor and recipient presented as an ABO major mismatch requiring red cell sedimentation. In the video the process of red cell sedimentation is performed at room temperature with the use of a plasma extractor (Fenwal, Lake Zurich, IL) (2). Hydroxyethyl starch (Hespan, 6% solution; B. Braun Medical, Irvine, CA), which was added during collection to aid granulocyte recovery, also facilitated sedimentation (2, 3). The time lapse video allows us to watch the slow process of red blood cells settling at the bottom of the collection bag. Sedimentation time is unique for each component as it is dictated by the donor's baseline erythrocyte sedimentation rate (4). While this typically occurs between 2–3 hours, and has

Correspondence: Willy A Flegel MD, NIH Clinical Center, Department of Transfusion Medicine, Building 10, Room 1C733c (MSC-1184), 10 Center Drive, Bethesda, MD 20892-1184, U.S.A., waf@nih.gov, Phone 301-594-7401, FAX 301-496-9990.

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been documented to take up to 7 hours, the entire process cannot surpass the expiration of the unit at 24 hours from the end of collection (2). Although a large majority of red blood cells are removed by sedimentation, the process does not reduce the red blood cells to less than 2 mL, thus still requiring a crossmatch per AABB Standards (1,2). Optimal sedimentation achieves a balance between minimizing the red blood cell contamination and maximizing the recovery of granulocytes, while not exhausting the short lifespan of the granulocytes during the process.

Efficacy of transfusion with granulocytes (5) and safety of hydroxyethyl starch (6) have been studied and reviewed. The Apheresis Granulocytes component in the video was transfused to a 28 year old man undergoing a haplo-identical hematopoietic progenitor cell (HPC) transplantation with coinciding persistent abdominal abscesses caused by *Candida albicans*, *Candida glabrata*, and vancomycin-resistant *Enterococcus faecium*. He received 6 granulocyte transfusions over 2 weeks until HPC engraftment occurred and the white blood cell concentration recovered (an audio transcript for the Video Clip S1 is provided in Appendix S1, available as supporting information in the online version of this paper).

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.