2017

The Extension of RBC Longevity and Functionality in the Prevention of Graft Versus Host Disease

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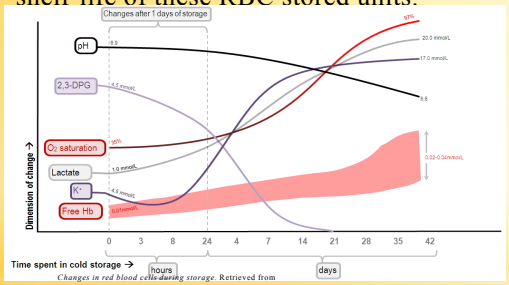
Introduction

- Routine standard blood storage with SAGM-CDP additive solutions helps preserve red blood cells (RBCs) for up to 42 days before they are discarded.
- However, during those 42 days, significant biochemical and physiological changes occur within the RBCs due to oxidative stress due to storage.
- Although the current storage system won't adequately protect the RBCs, a new combination of additives that focus on alleviating oxidative stress could increase the shelf-life of these RBC stored units.



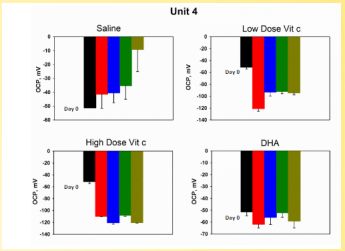
Changes in red blood cells during storage. Retrieved from http://www.derangedphysiology.com/php/Haematology-and-Oncology-in-Critical-Illness/images/changes%20in%20packed%20red%20blood%20cells%20during%20refrigerated%20storage.jpg

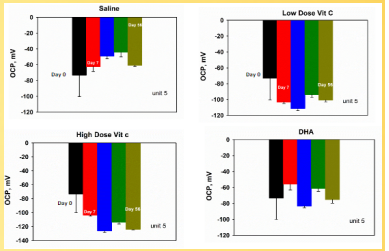
Methods

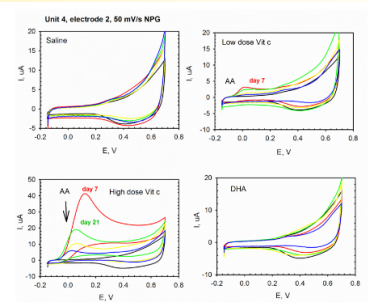
- Application of Cyclic Voltammetry (CV) and Open Circuit Potential (OCP) measurements to ascertain RBC redox potential
- Administration of a spectrum of concentrations of Ascorbic Acid (AA) and Dehydroascorbic Acid (DHA) in 4 different samples of stored blood - Saline, 0.3 mM AA, 3 mM AA, and 0.3 mM DHA
- Preparation of Nanoporous Gold (NPG) mounted electrodes via Nitric Acid dealloying mechanism.

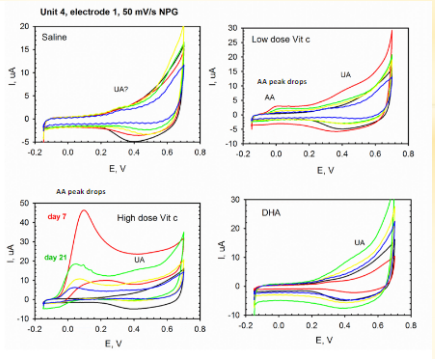
Results

- Units 4 and 5 (pictured on the right) both show a firm "static" stage with blood potential, indicating that the treated solution of Vit C allows RBC to resist potential change
- Cyclic Voltammetry Studies of Units 4 and 5 (below) demonstrate uniformity within different electrodes, thereby eliminating variability between results



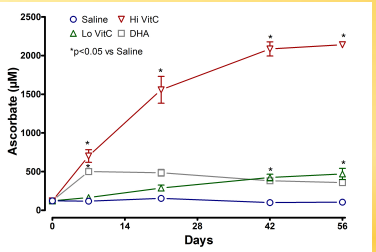






Conclusions

- Thus far, we have observed a gradually positive trend.
- That is, the reducing agents added have resisted the oxidative change stored RBCs normally see.
- Compilation of results demonstrate that the treatment of RBC by Vitamin C and derivatives causes a quantifiably significant resistance of blood potential by oxidative stress



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Acknowledgements

We would like to thank Dr. Maryanne Collinson, Dr. Joseph Reiner, and Dr. Ramesh Natarajan for their support and guidance throughout the research process. In addition, I would like to thank Dr. Kimberly Sanford, director of the Blood Bank at VCU as well as the Commonwealth Transfusion Foundation for funding. I would like to also thank the Honors College for funding and continued support throughout the entire process.

Further Information

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