Title: Serum uric acid is effectively correlated with the quality of donated red blood cells under blood bank conditions

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Abstract

Statement of the Problem: During their preservation at blood banks, red blood cells (RBCs) undergo several physiological alterations/deteriorations collectively known as "RBC storage lesion". A significant part of the storage lesion is driven by oxidative stress, while some of its critical aspects are considered donor-related. Having in mind that serum uric acid (UA) represents almost 60% of the total antioxidant capacity of the donor's plasma, the aim of this study was to provide evidence regarding the potential usefulness of UA as a donor-specific marker of storage quality. **Methodology & Theoretical Orientation:** For this purpose, 47 non-leukoreduced units of RBC concentrates in CPDA-1 produced from male regular blood donors were stored for 35 days. Several storage quality parameters (cell shape, redox homeostasis, extracellular vesicles/EVs etc.) were examined at the beginning (day 2), the middle (day 18) and the end (day 35) of the storage period. SPSS was used for statistical analysis. **Findings:** Antioxidant capacity of the blood bags' supernatant was correlated with the UA levels *in vivo* ($R=0.718$, $p<10^{-7}$) throughout the storage period. *A posteriori* splitting of the donors in high- and low-UA groups, revealed statistically lower intracellular ROS and calcium accumulation after the middle of storage ($p<0.05$) in the high UA group. Finally, units from high UA donors demonstrated lower levels of irreversibly modified RBCs (22.5±2.9% vs 27.1±1.6%) and different size distribution of EVs on day 35 of storage ($p<0.05$). **Conclusion & Significance:** Variability in UA levels *in vivo* is maintained during storage and of note, it seems to be associated with the redox status and morphology of stored RBCs. Uric acid as a donor's signature in blood components may be a very promising candidate biomarker of RBC storage lesion.

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Image

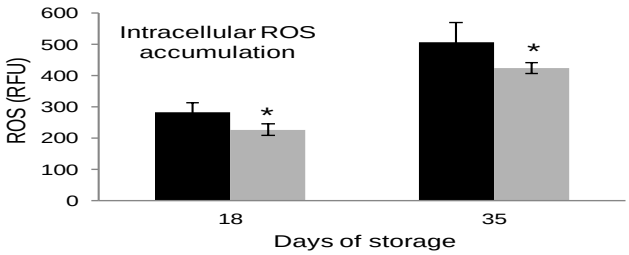


Figure Intracellular ROS accumulation was significantly lower in donors with higher pre-storage levels of UA both at the middle and the end of storage. (*) $p<0,05$ high *vs* low UA

Recent Publications

1. Tzounakas VL, Georgatzakou HT, Kriebardis AG, Voulgaridou AI, Stamoulis KE, Foudoulaki-Paparizos LE, Antonelou MH, Papassideri IS (2016): Donor variation effect on red blood cell storage lesion: a multivariable, yet consistent, story. *Transfusion 2016 Jun;56(6):1274-86*
2. Tzounakas VL, Georgatzakou HT, Kriebardis AG, Papageorgiou EG, Stamoulis KE, Foudoulaki-Paparizos LE, Antonelou MH, Papassideri IS (2015): Uric acid variation among regular blood donors is indicative of red blood cell susceptibility to storage lesion markers: A new hypothesis tested. *Transfusion 2015;55:2659-71*
3. Abonnenc M, Crettaz D, Marvin L, Grund B, Sonego G, Bardyn M, Tissot JD, Prudent M, Bertrand Rochat B, Lion N (2016): Metabolomic profiling highlights oxidative damages in platelet concentrates treated for pathogen inactivation and shows protective role of urate. *Metabolomics (2016) 12:188*



Biography

Vasileios L. Tzounakas is a Post-doctoral researcher at the Department of Biology (Section of Cell Biology & Biophysics) of the National and Kapodistrian University of Athens (NKUA). He has obtained Ph.D. in Cell Biology. He has served as reviewer in international journals while his main research interests include blood transfusion biology (mainly, red blood cell storage lesion in blood products used for transfusion), erythrocyte biology in health and disease and the study of extracellular vesicles. In particular, he has expertise in evaluating the key parameters that affect storage lesion and post-transfusion performance of red blood cells and in the management of blood supplies in a way that will lead to the individualization of transfusion therapy. In this context, he has focused on the elucidation of storage lesion's features that may serve as a donor's signature, namely "the donor variation effect".

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Notes/Comments:

1. Please consider the present submission for an e-poster presentation.

2. Please include the following statement at the end of the abstract "*This study was supported by "IKY FELLOWSHIPS OF EXCELLENCE FOR POSTGRADUATE STUDIES IN GREECE – SIEMENS PROGRAM" to Vasileios Tzounakas*"