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

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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 uric acid (UA) represents almost 60% of the total antioxidant capacity of 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

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, intracellular reactive oxygen species/ROS and calcium accumulation, lipid peroxidation and size distribution of extracellular vesicles/Evs) were examined at the beginning (day 2), the middle (day 18) and at the end (day 35) of the storage period. SPSS was used for statistical analysis.

FINDINGS

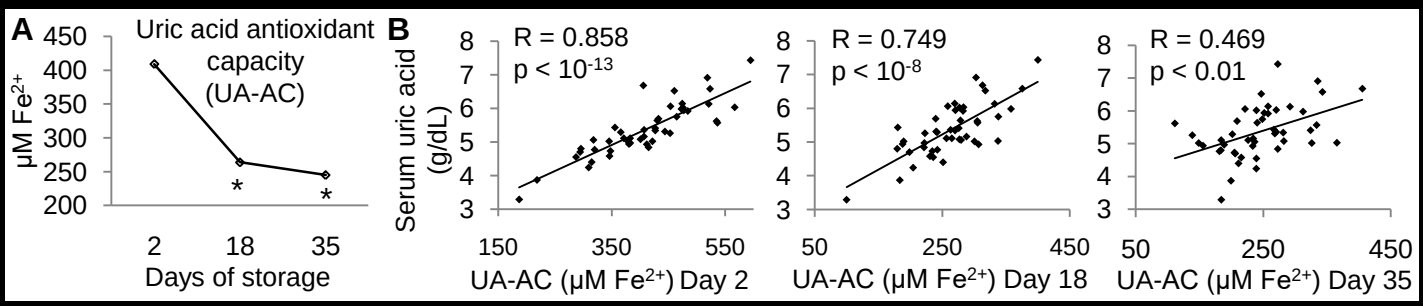


Figure 1 **(A)** Uric acid-dependent antioxidant capacity (UA-AC) declined during storage. (*) p<0.05 storage *vs.* day 2. **(B)** Scatter plots demonstrating strong positive and significant correlations between the UA levels in fresh blood and the UA-AC of RBC units at any storage period (n=47). The vertical axes of scatter plots represent serum UA levels.

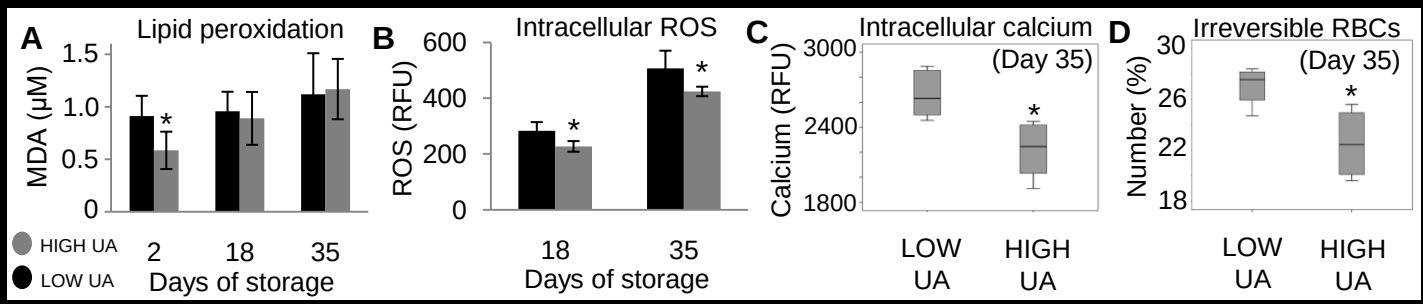


Figure 2 *A posteriori* splitting of the donors in high- and low-UA groups (n=8 for each group. Δ_{UA}=2.3 g/dL between them), revealed statistically lower **(A)** lipid peroxidation of the blood bags' supernatant at the beginning of the storage period, **(B)** intracellular ROS accumulation after the middle of storage, **(C)** intracellular calcium accumulation and **(D)** percentage of irreversibly modified RBCs at the 35th day of storage, in the high UA group. (*) p<0.05 high vs. low UA.

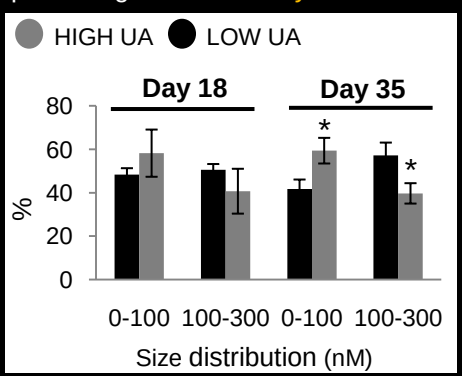


Figure 3 Size distribution of extracellular vesicles (Evs) by Dynamic Light Scatterring analysis. RBC units from donors exhibiting high UA levels *in vivo* contained less EVs within the size range of 100-300 nm at the end of the storage period. (*) p<0.05 high vs. low UA.

CONCLUSION & SIGNIFICANCE

*Variability in **UA levels in vivo** is maintained **during storage,** in close **association with** the **redox status** of the RBC units and the RBC **morphology**. **Uric acid** as a **donor's signature in blood components** independently of the storage strategy followed, is a promising candidate biomarker of storage lesion*

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