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The method of the prolongation of platelet storage time

SUMMARY

The storage of platelet concentrates (PCs) is associated with several limitations. PCs can typically be stored for about 5 days, which poses difficulties in the delivery and distribution of PCs to patients. Platelet concentrates are stored in specialized solutions to maintain their viability and functionality. The storage of PCs can lead to a gradual loss of platelet function, including activation, adhesion, aggregation, and release of growth factors. This decrease in platelet functionality can affect the effectiveness of PC transfusions. The presented doctoral dissertation aimed to develop and test an innovative method for preserving platelets during storage. This method was based on the effects of two modulating factors: near-infrared radiation and the ticagrelor, on platelet properties. The research was conducted using optical aggregometry, flow cytometry, spectrofluorimetry, coagulometry, and spectrophotometric measurements. The study involved a detailed analysis of, inter alia, morphology, aggregation, activation, viability, oxidative stress, glucose concentration, and fibrinogen levels in stored PCs. The results of the study showed that changing the dilution of KKP is a sufficient factor to reverse the effect of the ticagrelor. Moreover, the experiments confirmed the interaction of this drug with the platelet cell membrane. The applied methods for protecting platelets during PC storage proved effective in several aspects. Data analysis indicated that near-infrared radiation contributed to the reduction of lipid peroxidation levels in stored PCs and also exhibited a stabilizing effect on cell count after 8 days. Additionally, the conducted experiments confirmed the impact of the investigated factors on platelet survival. The conclusions drawn from the research indicate the beneficial effects of the applied factors on the functional parameters of platelets during storage. The obtained results provide new insights into the effects of near-infrared radiation on stored platelets and the potential use of ticagrelor as a platelet-protective agent. The doctoral dissertation represents a significant contribution to the field of biomedical engineering, contributing to the advancement of knowledge regarding the storage of blood products. The results of this dissertation have practical implications and can be used in blood centers.


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