

EFFECT OF EXTRACELLULAR pH ON PLATELET CONCENTRATES

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Background. During storage of platelets, among other changes (known as “platelet storage lesion”), a gradual decrease of pH as a result of lactate production takes place. So far, it is unknown if the pH decrease as such induces the “platelet storage lesion”. Therefore, we decided to apply various pH values to washed platelets, resuspended in additive solution (to avoid plasma effects) and to investigate several biochemical parameters during storage.

Methods. To remove plasma, the platelets were washed in a buffer supplemented with acid citrate dextrose (ACD) and the pellet was resuspended in additive solution containing 40 mM phosphate at various pH (range 6.15 – 7.50). Samples were stored in culture flasks under 5% CO₂, in the presence of 10 mM glucose and 12 mM bicarbonate. At various times during storage, samples were taken to analyze blood gas, platelet count, glucose, lactate, mitochondrial membrane potential (with JC-1), PS exposure (with AnnexinV) and CD62P expression.

Results. An applied pH between 6.8 and 7.2 (at 37°C) was found to be optimal, with at lower or higher pH values increased rates of glycolysis and CD62P expression (about 20 %). The applied values were well maintained during storage for up to 6 days, except for the low pH values as all glucose was converted to lactate. The increase of PS exposure was similar at all pH values tested during the first 3 days. At day 6, the PS exposure was clearly increased for those samples with low pH in which the glucose was depleted. The JC-1 signal was relatively constant over the first 3 days, independent from applied pH, and collapsed on day 6 only in the samples without glucose.

Conclusions. Our results indicate that human platelets during storage at pH < 6.8 and > 7.15 do change with respect to some, but not all characteristics of the “platelet storage lesion”. The enhancing effect of low pH on glycolysis represents a potentially deleterious forward loop under other conditions of storage, e.g. in plasma or plasma/additive solution mixture.