Impact of Prolonged Storage on the Blood Group Antigenicity of Reagent Red Blood Cells

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Introduktion

Preserving reagent red blood cells (RBC) is critical for ensuring reliable results in Immunohematology testing prior to blood transfusion.

Prolonged RBC storage can lead to hemolysis and loss of blood group antigens, which may lead to false-negative results and potentially result in incorrect transfusion therapy. Our in-house reagent RBCs are preserved in ID-Cellstab (Bio-Rad Laboratories) and has a durability of 33 days.
Aim:

- To evaluate the effect of prolonged storage on the antigenicity of Rh, Duffy, Kell and MNS blood group antigens.
- To measure the level of hemolysis in reagent RBCs.
- To determine whether the shelf life of reagent RBCs could be extended to 75 days.

Materialer og Metoder

Reagent RBCs stability was assessed on days 0, 32, 39, 45, 60, and 75. Hemolysis was measured using HemoCue Plasma/Low Hb Photometer. Antigenicity was evaluated through antibody titration using 11 patient samples with single alloantibodies. Two double-dose RBCs were selected for each antigen within Rh, Duffy, MNS and Kell and suspended in ID-CellStab at 0.8%, 5 % and papain treated 0.8%. Manual titration was performed using tube-IAT, BioRad Column Coombs anti-IgG ID, and Neutral Cards. End point titers and titer scores were compared across all storage days.

Resultater

Antibody titers and titer scores remained stable for antibodies targeting Duffy, Kell, and MNS and most Rh antigens. Anti-c declined by two titer steps on day 75 using 5% RBCs. Titer scores of anti- Fya and anti-c declined by more than 10 points atter 45 days. Hemolysis remained low in 0.8% RBCs or papain-treated 0.8% RBCs, while a slight gradual increase in 5% RBCs was observed over the 75-day storage period.

Diskussion

The results show that Duffy, Kell, MNS, and most Rh antigens remained stable for up to 75 days. Slight decreases in antigenicity for Fya and c antigens in 5% RBC suspensions indicate that some antigens may be more sensitive to prolonged storage, especially in higher RBC concentrations. Hemolysis measurements further suggest that lower RBC concentrations better preserve cell stability over time.

Konklusion

Reagent RBCs stored in ID-Cellstab maintain antigenicity and show minimal hemolysis for up to 45 days, supporting the possibility of extending their shelf life.