Editorial Overview

B. von Bormann[1], R. Zander[2], V. Kretschmer[3]

[1] Department of Anesthesiology, Intensive Care Medicine and Pain Therapy, Duisburg
[2] Institute of Physiology and Pathophysiology, University of Mainz
[3] Department of Transfusionmedicine and Hemostaseology, University of Marburg

Donor blood as well as autologous blood from preoperative predeposit are used for extracorporeal systems such as heart lung machine or they are stored for later transfusion or retransfusion respectively. Depending upon time of storage, the quality of blood is limited by variations of particular blood components with consecutive loss of physiological function.

The following communications focus attention on
- determination of in vitro quality of extracorporeal (stored) erythrocytes
- physiological function of stored erythrocytes after transfusion
- techniques to improve quality assessment of erythrocytes after collection and during storage
- new methods of blood collection and blood storage like leucocytedepletion or different additional solutions leading to better erythrocyte quality and probably prolonging duration of storage.

The quality of packed red cells in different additive solutions has been investigated by *Pindur et al.* performing an in vitro-study using hemorheological techniques. Distortion of red cells during storage is best prevented by ADSOL compared with PAGGS-M and SAG-M, whereas microaggregates are less apparent when the latter has been used. The conclusion of the authors to use microfilter systems for (re-)transfusion of red cells with ADSOL seems to be a step backwards, and we have to wait for users reaction.

Selective transfusion strategy means giving erythrocytes as packed cells strictly separated from fresh frozen plasma, depending upon individual indication for each component. This general agreement is questioned by *Mansouri Taleghani et al.* presenting results of leucocyte depleted whole blood (LKDPL-WB) stored in CPDA-1 compared with whole blood without leucocyte depletion. The high quality of LKDPL-WB even after 49 days of storage demonstrated by the group of workers should raise a new discussion about the topic „packed red cells versus whole blood".

Hyperkalemia in stored blood has no clinical relevance which has been proven again by *Walther-Wenke and co-workers.* As a result of her investigation, only total amount of potassium has some evidence, but not the extracellular concentration.

All usual solutions for stabilizing red cells during storage contain a relevant amount of acid with the consequence of acidosis. Therefore, acidosis of stored red cells should be established using base excess better than pH-value. *Zander et al.* demonstrated a decrease of base excess in packed red cells to – 50 mmol/l after 6 weeks of storage. The authors conclusion is to prefer shortly stored erythrocytes for massive transfusion and to remove supernatant, replacing it with fresh frozen plasma in pediatrics.

The increase of acidosis in red cell concentrates during storage is mainly due to the production of lactic acid by the erythrocytes, which is shown by the results of *Lachtermann and co-worker.* Lactic acid produced by erythrocytes and separated in the extracellular space leads to the significant decrease of base excess during storage.

The most important parameter to assess the quality of erythrocytes and techniques to improve it, is the capability of red cells transporting oxygen in vivo. The crucial question for the physician treating patients with erythrocyte tranfusions, reviewed by *von Bormann et al.*, is if red cell transfusion has a proven benefit on tissue ogygenation. Under the criterion of „evidence based medicine" the authors did not find a single clinical trial, confirming that oxygen consumption is compromised by normovolemic hemodilution to a hemoglobin concentration (cHb) of 7 g/dl or that it is improved by transfusing anemic patients to a cHb level of 10 g/dl or above. The authors emphasize the study of *Hébert et al. (authors Lit.-Nr. 28):* With respect to mortality and morbidity, the authors clearly demonstrated the superiority of restrictive transfusion therapy (indication for red cell transfusion: cHb < 7,0 g/dl) compared with liberal therapy (indication for red cell transfusion: cHb < 10,0 g/dl). The conclusion of *von Bormann et al.* is that the recommendation of *Hébert et al.* („A restrictive strategy of red-cell transfusion is at least as effective as and possibly superior to a liberal transfusion strategy in critically ill patients, with the possible exception of patients with acute myocardial infarction and unstable angina") should result in a change of usual transfusion practice. The authors stress that worldwide there are no general accepted and practiced transfusion standards.

Moersdorf et al. in an in vivo-study were not able to show any differences of hemorheological parameters after transfusion of packed red cells, collected and stored using different additive solutions for stabilising biological properties. Thus, in vitro-results (see *Pindur et al.*) could not be confirmed in vivo.

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Concentration of free hemoglobin in packed red cell units should not exceed 0,8 %, as settled by European guidelines. For laboratory analysis methods producing accurate results are essential. *Tapernon et al.* investigated the accuracy of free hemoglobin analysis, including 73 German laboratory affiliations. As a result, the authors strongly recommend only two techniques: cyanhemiglobin method and 3-wave-length method from *Harboe*.

The course of various parameters in red cell concentrates during storage is of increasing interest for quality controls, including free hemoglobin, potassium, glucose, lactate and pH-value. All these parameters can be determined with adequate accuracy using the analyzer AVL Omni®. In addition, as emphasized by *Sipurzynski-Budraß et al.,* only very little specimens are needed for analysis, which is of special interest für pediatrics and obstetrics.

Zander reports about another attempt for better preservation of stored or washed red cells using a so called physiological erythrocyte protection solution that containes electrolytes (isotonic, isoionic), gelatine (isooncotic) plus bicarbonate (24 mmol/l). As a result of this mixture base excess is 0 mmol/l, pH-value is 7,4, and carbon dioxide tension is 40 mmHg.

Concerning the opinion of *Pindur et al.* pentoxifyllin protects erythrocytes against distortion during storage.

Mechanical stress of erythrocytes occur during autotransfusion with cell saver and similar devices and during extracorporeal circulation. Additive solutions used for washing or dilution may differ significantly from physiologic composition. Under this point of view *Sümpelmann et al.* found advantages for gelatine compared with cristalloids, hydroxyethylstarch and dextran. The protective effect of gelatine could be observed using it as washing solution, during autotransfusion, or dilution during extracorporeal circulation.

Prof. Dr. med. Benno von Bormann

Klinik für Anästhesiologie,
operative Intensivmedizin und Schmerztherapie
St. Johannes-Hospital
An der Abtei 7-11
47166 Duisburg

E-mail: vbormann@jodu.de