Laboratory Investigation of Transfusion Reactions
Nicole A. Aqui, MD
College of American Pathologists’ Transfusion Medicine Resource Committee

In the broadest possible terms, a transfusion reaction is any unfavorable transfusion-related event occurring in a patient during or after transfusion of a blood component. The most important action to take when a transfusion reaction is suspected is to stop the transfusion. An intravenous line with normal saline should be maintained. The patient should then be assessed and supported as necessary while the patient’s physician and the transfusion service are notified. A responsible physician will need to evaluate the patient and determine appropriate clinical care. Bedside clerical checks of all forms, labels and patient identification are required to verify the correctness of the unit and the intended recipient. The unit and all tubing should be returned to the blood bank, along with post-infusion blood and urine samples as clinically indicated. Finally, the reaction should be documented in the patient’s chart.1 Once these initial measures have been implemented, the investigation of the reaction by the transfusion service can proceed.

Although every laboratory will have developed its own standard operating procedures for transfusion reaction workups, three preliminary tests should be performed immediately in all suspected transfusion reactions:2

- **Clerical check.** Unfortunately, many transfusion reactions occur because of preventable clerical errors.2 Mislabeling the product and misidentifying the recipient must be ruled out by carefully reviewing the records. These include patient identification, blood component labels, type and crossmatch data and requisition forms.

- **Visual inspection.** The patient’s post-reaction serum or plasma should be inspected for evidence of hemolysis and compared to pretransfusion samples, if available. A pink or reddish hue present only in the posttransfusion specimen is indicative of hemolysis and hemoglobinemia. A recent study illustrated that as little as 2.5 mL of lysed red blood cells are discernible.3 However, free myoglobin released from muscle can also cause a red or pink discoloration and should be distinguished from hemoglobin if the patient has crush injuries. If the sample was collected at least three to six hours after the hemolytic event occurred, bilirubin may be present in the plasma, causing a bright yellow discoloration. Heart bypass machines and medications or other solutions “piggybacked” on blood lines are common causes of non-immune intravascular hemolysis.
- **Direct antiglobulin test (DAT).** The DAT is used to demonstrate the presence of antibodies or complements bound to red blood cells. A positive DAT in only the posttransfusion specimen indicates red blood cells expressing antigens to which the patient has been previously sensitized have been transfused. However, the DAT can be paradoxically negative if the incompatible red blood cells have been rapidly destroyed. If the DAT is positive, an elution should be performed to identify the specificity of the antibody or antibodies present. A repeat ABO type on the posttransfusion specimen is required, though repeating the antibody screen and crossmatch should also be considered. Red blood cell phenotyping may also be indicated, based on the DAT results.

These initial procedures are used to determine the likelihood that a hemolytic transfusion reaction has occurred. If there is evidence of hemolysis or if the clinical situation suggests something severe and unusual, e.g. transfusion associated lung injury (TRALI) or bacterial contamination, the pathologist should make every effort to promptly communicate these results to the clinician. If these initial procedures are negative, it is unlikely that a reaction was due to hemolysis. However, additional testing may be necessary if warranted by the patient’s condition. This testing may include, but is not limited to, hemoglobin, hematocrit, bilirubin, lactate dehydrogenase and urinalysis. Regardless, the final results of the investigation need to be reviewed and interpreted by the pathologist and included in the patient’s medical record.

Both the College of American Pathologists (CAP) and the American Association of Blood Banks (AABB) require prompt investigation and reporting of potential hemolytic transfusion reactions. The transfusion service is responsible for developing written policies and procedures to optimize transfusion practices. This should be considered an opportunity to educate clinicians and improve patient safety—not an obligation to fulfill regulatory requirements.

References

