IMMEDIATE HEMOLYTIC TRANSFUSION REACTION
IN A PATIENT WITH A NEGATIVE BLOOD GROUP ANTIBODY SCREEN
ANSWERS

1. On the basis of these findings, should any additional testing be performed? What test(s)?

   In transfusion reaction investigation two comparisons between a pre- and post-transfusion specimens are performed in order to rule out a hemolytic transfusion reaction, namely inspection of the plasma or serum for hemoglobinemia and a DAT. If either of these simple tests is positive, further investigation is warranted to determine whether the transfusion was incompatible. In this case although the DAT is positive on both the pre- and post-transfusion specimens, the DAT result has changed, and the case should be investigated further.

2. What type of antibody could cause a positive crossmatch but not be detected in the antibody detection test ("antibody screen")? What testing would you like to do next to identify the antibody?

   An antibody against a low frequency antigen that is not present on the antibody detection cells but was present on the donor RBCs could cause this set of reaction results. In the US certain antigens are required by regulation to be present on the antibody detection cells, in this case a set of three cells, and the antibody detection test is expected to detect significant levels of antibodies directed against those antigens. The antibody screen can also be expected to detect antibodies against high frequency antigens, but cannot express all of the many low frequency antigens. This is an important cause of a false negative antibody detection test.

   In order to identify the antibody specificity a laboratory must have examples of rare cells bearing low frequency antigens or have sera directed against low frequency antigens that can detect their presence on the donor RBCs. Identification of the ethnicity of the donor may aid in selecting which antibodies to investigate.

3. What is the antibody that caused this reaction?

   The selected cell panel in this case identified anti-Wr^a. Note that there are three cells that express the Wr^a antigen that are reactive and three cells that do not express the antigen that are non-reactive. The only criterion for identification of an antibody that is missing in this case is demonstration that the patient herself lacks the antigen. However, since Wr^a is a low frequency antigen, such a demonstration would add less to the certainty of antibody identification than it usually does.

4. Why is the eluate from the post-transfusion specimen reactive, but that from the pre-transfusion specimen is not? Did the patient only express detectible levels of the antibody after transfusion?

   Only the eluate from the post-transfusion specimen is reactive with Wr^a positive RBCs. This is not because the patient did not have the antibody before the transfusion. The fact that the antibody was present before transfusion is demonstrated by the positive crossmatch with the pre-transfusion specimen. The difference in the DAT and eluate results stems from the fact that the pre-transfusion RBCs drawn from the patent are only her own, and do not express Wr^a antigen that her antibody can bind to. However, after transfusion she has donor Wr^a positive RBCs in her circulation that adsorb her antibody producing a DAT positive population in the post-transfusion specimen. This population yields anti-Wr^a into the eluate which can be detected when it is reacted with antigen positive cells.

5. How often does this sequence of events occur when the crossmatch is limited to immediate spin reading when the antibody screen is negative (see Perkins JT, et al. Transfusion. 30;503-7:1990)

Multiple large studies from transfusion services in the United States have estimated the frequency at which the antibody detection test is negative but a crossmatch that includes an anti-human-globulin phase detects a potentially hemolytic antibody. This event occurs in approximately 1 in 25,000 such crossmatches. Note however that antigen frequencies vary in different populations, and an antigen that is rare in one population may be common in another. The more frequent the antigen, the more frequently individuals lacking it are exposed in the form of transfusion or pregnancy. Thus any such study of the efficacy of the type-and-screen procedure to detect potential blood group incompatibilities is limited to the population tested and the antigen composition of the antibody detection cells. For example, in Taiwan, the frequency of the antigen Mur (Mi III or Mi^a) and the corresponding antibody ("anti-Mi^a") necessitates that the antigen be present on all reagent cells used for antibody detection (Lo SC, et al. Vox Sang. 2002;83:162-4.)