Rare blood challenges blood bank and patients

By Louann Dake, MA, MT(ASCP) SBB

Often in casual conversation, a new acquaintance will ask what my job is. “Problem solving for people with rare blood” is my answer. It is surprising how often people respond by saying that they have rare blood — usually they say they are group AB or that they are Rh negative.

Are these really “rare” blood types? Group AB is not rare, since approximately 4% of individuals in the U.S. population are AB, and Rh-negative individuals comprise about 15%. What is rare blood? Rare blood is blood that is negative for multiple blood-group antigens or lacks a high-frequency antigen. And who are the patients that may require these units of “rare” blood?

Routine pre-transfusion testing involves the determination of a patient’s ABO and Rh type. In addition, a screen for atypical blood-group antibodies is performed. If the antibody-screening test is positive, then antibody-identification studies are performed. When a patient receives a blood transfusion or has been pregnant, she is exposed to foreign blood-group antigens. Some patients form antibodies against these foreign antigens if their own cells lack the corresponding antigen.

For example, a person whose cells lack C antigen — a common antigen in the Rh blood-group system — may form anti-C. This patient will then require red cells for transfusion that lack C antigen. These units are relatively easy to provide, since 70% of the donors are C negative. Sometimes, patients will form more than one antibody, requiring that units for transfusion be matched for several blood-group antigens.

If our patient formed both anti-C and anti-e, units would be much more difficult to provide, since only 2% of donors lack both C and e antigens. If this patient also made antibodies directed against antigens in the Kidd, Duffy, or MNS blood-group systems, more extensive matching would be required, and the percentage of available units would decrease significantly.

“Uncommon” blood types

When red cells are needed for transfusion for these patients with multiple antibodies, units are available through the local blood supplier’s immunohematology reference laboratory. Most of these laboratories maintain a stock of blood from donors who have been typed for all the common blood groups. Although these units are not defined as “rare,” they could be considered “uncommon.”

Patients with sickle-cell anemia often require repeated transfusions over a long period of time. Since they have many exposures to donor red cells, they often form multiple blood-group antibodies. It is not at all unusual that these patients require donor cells that are negative for C, E, K, S, Fy^a and Jk^b antigens. When you consider the incidence of these antigens in the donor population, only one in a hundred units would be compatible.

Overcoming incompatibility

Occasionally, we encounter a patient who has an antibody that reacts with all cells tested. These patients may have an antibody directed against a high-frequency antigen that is present on the red cells of most donors. The patient’s ethnic background, along with reactivity of the antibody when tested against red cells that have been treated with enzymes and DTT (dithiothreitol), provide important clues as to the cause of the incompatibility.

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Immunohematology reference laboratories can then identify these antibodies by testing the patient’s red cells with rare frozen antisera from patient samples that contain previously identified antibodies to high-frequency blood-group antigens and by testing the patient’s serum vs. rare-cell samples.

For example, in the Kell blood-group system, the high-incidence antigen Kp^b is present on the red cells of greater than 99.9% of Caucasians and virtually 100% of persons of African descent. This antigen is destroyed on red cells that are treated with DTT and shows enhanced reactivity when enzyme treated cells are tested. Based on this reactivity, the laboratory might type the patient’s red cells using a rare serum containing anti-Kp^b; and, if the patient were negative, rare Kp^b antigen-negative cells would be tested to confirm the specificity of the antibody.

When an antibody directed against a high-frequency antigen has been identified, locating rare units for transfusion can be difficult. If routine surgery is scheduled for a future date, autologous donation can be considered. Family members should be tested, especially siblings, since the probability that a relative may also lack the rare-blood-group antigen is high. If no suitable donors are found among family members, the American Rare Donor Program (ARDP) can be contacted.

Finding rare blood

The ARDP is a joint program of the AABB (American Association of Blood Banks) and the American Red Cross Blood Services that coordinates the process for locating and procuring units of rare blood and maintains a registry of rare donors.
When an accredited immunohematology reference laboratory contacts the ARDP, a search for the required rare unit(s) of red cells is initiated. A fax is sent out to all the member reference laboratories requesting the needed units. The individual laboratories may have the rare units in their frozen red-cell inventory or may be able to recruit a donor with the desired blood type. If the member laboratory can supply the needed red cells, they contact the ARDP who then arranges for the blood to be shipped to the requesting laboratory.

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The following organizations offer more information on rare-blood types and rare-blood disorders:

**American Rare Donor Program (ARDP)** has approximately 80 member facilities: [www.redcross.org/news/bm/blooddonation/010315rare.html](http://www.redcross.org/news/bm/blooddonation/010315rare.html).

**American Red Cross** has the world’s largest registry of rare-blood donors and maintains a supply of frozen rare blood for immediate shipment anywhere in the world: [www.redcross.org](http://www.redcross.org), or call 202-728-6400.

**Foundation for Blood Research** provides a variety of educational materials for the public, including a regular newsletter as well as reports and books: [www.fbr.org](http://www.fbr.org), or 800-639-8605.

**National Organization for Rare Disorders** is a federation of more than 140 voluntary health organizations serving those with rare disorders: [www.nord-rdb.com](http://www.nord-rdb.com).

**NIH/National Heart, Lung, and Blood Institute** plans, conducts, fosters, and supports an integrated and coordinated program of basic research, clinical investigations and trials, observational studies, and demonstration and education projects related to the causes, prevention, diagnosis, and treatment of heart, blood vessel, lung, and blood diseases: [www.nhlbi.nih.gov](http://www.nhlbi.nih.gov).

**United Blood Services** — a division of Blood Systems in Scottsdale, AZ, and part of an international network of facilities that keep a frozen inventory of rare blood — maintains a list of on-call rare-blood-type donors and an immunohematology lab to resolve blood cross-match and compatibility problems: [www.unitedbloodservices.org](http://www.unitedbloodservices.org).

*Information adapted from www.bloodbook.com*