Immunohematology Reference Laboratories

The Red Cross Immunohematology Reference Laboratories (IRL) is one of the largest IRL networks in the United States, with over 40 labs. Our notable size and technical experience allow us to serve a range of patients coping with diseases such as cancer, sickle cell disease and other hematologic diagnoses resulting in anemia. We regularly support hospital-based sickle cell disease management programs, as part of efforts to enhance treatment plans and overall patient care. Select IRLs provide platelet crossmatching services.

The specialists in our IRLs are sought-after contributors to AABB inspections, industry standard committees, state boards, and organizations and often speak at regional, national and international symposiums and educational events.

Additionally, our National Reference Laboratory for Blood Group Serology (NRLBGS), provides specialty IRL testing to the Red Cross network and supports the American Rare Donor Program.

Red Cell Antibody Investigations

Indication

- As ordered by the hospital blood bank, pathologist or patient's physician

Description

- Identification of red blood cell (RBC) antibodies to high prevalence, low prevalence, single and/or multiple antigens
- Evaluation of RBC autoantibodies
- Investigation of direct antiglobulin test (DAT)-negative autoimmune hemolytic anemia
- Positive DAT and eluate
- Drug-induced immune hemolytic anemia investigations
- RBC phenotyping of patients (also see Molecular Testing section)
- Donath-Landsteiner Test

- Cold agglutinins screen and titer, thermal amplitude test
- ABO discrepancy investigations
- Transfusion reaction investigations
- Prenatal antibody identification and titers for hemolytic disease of the fetus and newborn (HDFN)
- Preselected units for hospital compatibility testing

Test Methods

- Tube, gel and solid phase RBC adherence methods (may vary by location)
- Enhancements, serum neutralization and inhibition media
- Autologous, allogeneic and miscellaneous adsorptions
- Chemical treatment of RBCs and plasma
- Reticulocyte separations
- Elution techniques
- Titrations

Antigen-Negative Blood Products

Indication

- For patients with special red blood cell antigen negative requirements

Description

Our IRLs maintain an inventory of known antigen types to assist hospitals with antigen-negative blood needs. IRLs work through the American Rare Donor Program (ARDP) to locate and obtain rare units not available in inventory. Services include:

- Single and multiple antigen-negative RBC units
- RBC units negative for high and low prevalence antigens
- Hemoglobin S negative RBC units
- Access to the ADRP for rare RBC components including RH allele matching for variant Rh antigens

Antigen Matched RBC Units

Indication

- Patients who are alloimmunized to RBC antigens and require red cell transfusion
- For patients undergoing RBC transfusion therapy for management of sickle cell disease

Description

Due to chronic transfusions, alloimmunization to RBC antigens is a significant risk for many patients with sickle cell disease. Studies have shown that the transfusion of antigen-selected units is the standard of care for chronically transfused patients with sickle cell disease.* This may facilitate the long-term management of these patients. IRLs provide RBC units that are phenotypically matched with the patient's RBC antigens as requested by the physician.

Drug-induced Immune Hemolytic Anemia Evaluations

Indications

- Patients with hemolytic anemia with a temporal relationship to drug therapy. These patients usually have a positive direct antiglobulin test and usually no reactivity in an eluate prepared from their RBCs.

Description

In vitro drug-induced antibodies that are reactive in *in vitro* tests are in four general categories:

- Some drugs (e.g., penicillin and cephalosporins) bind firmly to RBCs. Normal RBCs can be coated with the drug, *in vitro*, and the patient's serum and/or eluate from the patient's RBCs is tested against the drug-coated RBCs to detect the presence of the drug-induced antibody.
- Many drugs will not covalently bond to RBCs, thus drug-coated RBCs cannot be prepared. Antibodies to such drugs are detected by incubating the patient's serum with the drug and RBCs and looking for hemolysis, agglutination and/or positive antiglobulin tests.
- Some drugs can bind protein non-specifically, and some normal sera will be reactive when drug studies are performed. This may require manipulation of tests including dilution studies.
- Drug-independent antibodies will react with RBCs *in vitro* without any drug being present (i.e., they appear as autoantibodies).

Test Methods

- Patient's serum/eluate tested against drug-treated RBCs
- Patient's serum tested against RBCs in the presence of a drug

Donath-Landstiner

Indication

- Diagnose paroxysmal cold hemoglobinuria (PCH) when there is evidence of intravascular hemolysis (e.g. hemoglobinemia and hemoglobinuria) and C3 only on the RBCs

Description

Serologic test used to detect the presence of a biphasic hemolysin.

Test Methods

- Serologic, Tube

Cold Agglutinins Titer

Indications

- IgM RBC agglutination with clinical indication of hemolysis

Description

Determines clinical significance of IgM agglutinins.

Test Method

- Serologic, Tube

Thermal Aptitude Test

Indications

- Cold agglutinin titer >40; RBCs positive with C3; clinical evidence of hemolysis

Description

Identify the thermal amplitude, titer, and specificity of an autoagglutinin suspected to be clinically significant.

Test Method

- Serologic, Tube

Monocyte Monolayer Assay

Indications

- Determination of suitability of incompatible blood transfusion using an *in vitro* (noninvasive) procedure to predict the *in vivo* extravascular hemolysis process. This testing is useful for IgG antibodies to a high incidence antigen or antibodies for which a specificity could not be determined, or for those with variable reports of clinical relevance.

Description

The Monocyte Monolayer Assay (MMA) is an *in vitro* procedure used to assist in predicting if incompatible blood can be transfused safely to a patient. The mononuclear cells are harvested from the whole blood of random healthy donors. The incompatible RBCs are sensitized with a fresh serum sample of the patient and incubated with the monocyte monolayer (obtained from layering the mononuclear cells onto a glass slide). RBCs are selected for sensitization based on the patient's RBC antibodies. A source of fresh complement is added to the test system for all antibodies except those in the RH system.

The "normal" range is determined by the testing laboratory using *in vivo* correlation studies. Values below the normal range indicate that the antibody is clinically insignificant and is unlikely to cause overt transfusion reaction due to transfused antigen-positive RBCs. Values above the normal range indicate that the antibody may cause the accelerated destruction of antigen-positive RBCs and may result in a hemolytic transfusion reaction.

Test Method

- Monocyte Monolayer Assay

*Citations available upon request.

American Rare Donor Program

The American Rare Blood Donor Program (ARDP) headquartered in Philadelphia, was first established as a collaboration with AABB and American Red Cross rare donor registries. For more than 25 years, the ARDP has worked to ensure that rare blood is available for patients who need it, utilizing their extensive network and large, centralized database of rare donors to locate rare and Rh allele-selected blood products worldwide.

With an extensive product inventory, the Red Cross is a major source for rare blood products. We provide support 24 hours a day, 7 days a week to the ARDP to ensure that all requests received are addressed as quickly as possible.