Inside transplant immunology

By Rebekah Arsenault

With over 96,000 Americans on the waiting list for an organ transplant, physicians and laboratory scientists associated with transplantation fill a vital role in today’s healthcare environment. Much attention is often placed on the transplant-center medical staff, but behind the scenes — making transplant surgeries possible — is the immunology laboratory.

The scarcity of donor organs has created an enormous challenge for transplant professionals. Due to the growing pool of patients in end-stage organ disease, each donated heart, lung, kidney, liver, and pancreas qualifies as a precious resource. A respectful balance between the gift of the donor organ and the needs of the potential transplant recipient begins in the immunology laboratory.

Often referred to as “the matchmaker,” immunology labs are responsible for identifying safe, compatible matches between donor organs and recipients. The twofold role requires extensively evaluating potential recipients as well as screening donors to ensure compatibility. Working in tandem with organ-recovery organizations and transplant centers, immunology labs strive to isolate “perfect” matches. An ideal matching scenario results in a 30-year half-life (wherein within 30 years, half of the transplant grafts would survive). Intermediate matches typically enjoy a 20-year half-life, while poor matches suffer a 10-year half-life.

In preparation to receive an organ, all patients on the waiting list undergo ABO blood testing and tissue typing or human leukocyte antigen (HLA) testing. Tissue typing identifies the HLA or major transplantation antigens on cell and tissue surfaces. Attempts are made to match the HLA antigens of donor and recipient for prolonged graft survival. Additionally, each patient’s antibody specificity — the property of antibodies which enables them to react with specific antigenic determinants — is recorded, and all test results are entered into a national database for transplant professionals to access; unacceptable antigen types are listed so only appropriate organ offers are made.

Because a number of life events such as prior transplants, blood transfusions, or pregnancies may cause increased sensitization in transplant patients, immunology labs also perform serum screenings — called panel or percent reactive antibodies (PRA) testing — to determine the level of HLA sensitizations and the likelihood of an appropriate match being found.

The two-step matching process

When an organ offer is made, a second cascade of screening events occurs. LifeLink Transplantation Immunology Laboratory in Tampa, FL, performs real-time nucleic-acid testing (NAT), which allows for the detection of HIV, West Nile virus, and hepatitis B genetic material. NAT is a more stringent protocol than simply testing the body’s response to an infectious disease (e.g., antibodies); and though not yet widely used throughout the country, it results in safer transplants for LifeLink patients. LifeLink’s immunology lab then performs crossmatching in two steps: virtual and final. The virtual crossmatch compares antibody specificity of patients to the HLA antigens of a given donor. This process predicts the results of the actual final crossmatch. LifeLink’s virtual crossmatching enables the import of organs from other centers and has proven invaluable to heart and lung recipients, who would wait much longer for a locally donated organ as well as a negative crossmatch. During the final, quantitative crossmatching, relative risk for each patient is identified and assigned, and positive or negative reactions are determined true or false. The two-step process has allowed LifeLink to successfully transplant patients regardless
of their degree of sensitization; the identification of false-positive reactions has resulted in almost 400 transplants for patients who would have likely been turned away from other centers.

**Lab follow-up with transplant patients**

After receiving their transplants, these highly sensitized patients make up a large segment of the group undergoing post-transplant monitoring for detection of donor-specific antibodies and cell-mediated immunity. Post-transplant lab results reveal the onset of rejection so medical staff can respond appropriately. In an effort to minimize rejection episodes, immunology professionals at LifeLink measure the immune status of patients vs. their organ transplants, and determine the type of rejection (cellular or humoral) that may occur. This allows immunology professionals to note changes in immune activity prior to clinical signs or symptoms. Post-transplant immune-response monitoring also provides recognition of increased responsiveness, which indicates a need for increased dosage of immunosuppressive medications. In this way, the immunology lab actually helps define the immunosuppressive protocol for the patient. Patients in an “immune quiet” period can safely lower their drug dosages to avoid complications and side effects. The effectiveness of different immunosuppressive medications — and the appropriate clinical action — can be determined by a blood test, which notes if antibodies or cells are causing immune activity.

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**What — and who — make up the lab?**

At the LifeLink Transplantation Immunology Laboratory, more than 1,000 patients and live donors are tested each year, along with 400 deceased donors. This results in more than one organ transplant per day within nine different transplant programs at three hospitals. The team within the immunology lab is comprised of laboratory supervisors, medical technologists, medical technicians, histocompatibility technologists, lab assistants, and quality-compliance coordinators. While technician and assistant positions may be filled by individuals with minimal experience, most positions require a four-year degree in immunology/serology or immunohematology and/or certification by the American Board of Histocompatibility and Immunogenetics. LifeLink’s laboratory functions on a 24/7/365 schedule.

With approximately 18 Americans dying every day while waiting for a transplant, the pressure to discover appropriate matches is enormous. Transplant immunology labs are acutely aware of the vital function they perform. LifeLink’s laboratory staff is recognized as a national and international leader in transplantation, and receives regular invitations to share their exceptional methods to the benefit of the entire field. “We are going to get people transplanted,” says William LeFor, executive vice president and director of LifeLink Transplantation Immunology Laboratory. “That’s our job.”

Rebekah Arsenault serves as marketing coordinator for the LifeLink Foundation, providing educational outreach to physicians throughout West Central Florida, and is pursuing a master’s degree in bioethics.

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