



# AST: Creating a *Community of Support*



AMERICAN SOCIETY OF  
TRANSPLANTATION



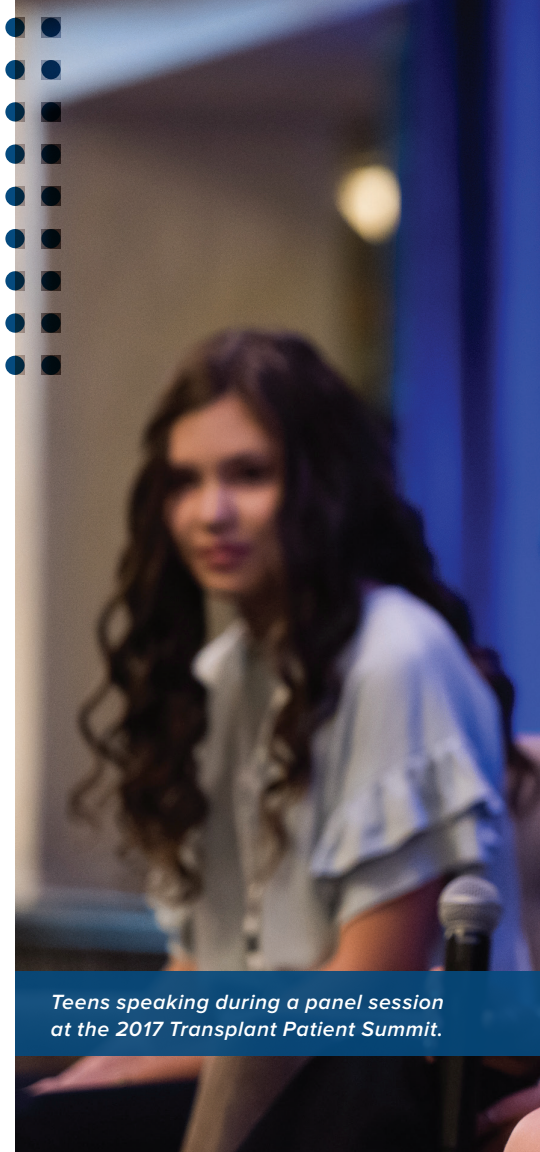
Power2Save  
ONE TRANSPLANT FOR LIFE

# *The Evolution of* **Organ Transplantation**

The advent of organ transplantation is a modern medical miracle. Since the first organ transplant in 1954, having a second chance at life has become a reality for hundreds of thousands of Americans. In fact, nearly 360,000 Americans are living today with functioning transplants, making transplantation one of the most effective therapies for end-stage diseases that cause kidney, heart, lung, and liver failure.

This remarkable success could not have happened without tremendous effort spanning many years, and significant investments in medical research, but there is still much more to learn. Researchers, both physicians and scientists, must continue to pioneer new approaches to address the diseases that cause organ failure, advance new therapies to measure and control the immune response, and ensure a brighter future for all these patients and their families.

Over the years, dedicated transplant physicians, surgeons, and scientists involved with the American Society of Transplantation (AST) have worked with the Department of Health and Human Services (HHS), National Institutes of Health (NIH), Food and Drug Administration (FDA), U.S. Congress, and many other key stakeholders to advance the science and clinical practice of organ transplantation and immunology.



*Teens speaking during a panel session  
at the 2017 Transplant Patient Summit.*








# *The Growing Need for Organ Transplantation Success*

Our life depends on the health and function of critical organs such as the heart, kidneys, lungs, and liver. However, each year millions of Americans experience end-stage organ failure. For some, it is a condition inherited from their parents and unavoidable. Others suffer injuries or diseases that damage their organs. For example, organ failure can result from high blood pressure, diabetes, obesity, autoimmune disease, and a variety of infectious diseases.

Over the past 60 years, science and technology have continually advanced the field of transplantation to offer patients prolonged life, but the number of people suffering from organ failure far outnumbers the supply of new organs. At the end of 2018, there were over 114,000\* people waiting for a life-saving organ transplant and someone is added to the national transplant waiting list every ten minutes. But sadly, approximately 20\* people will die each day waiting. As Americans live longer and more active lives, the age-related risks for organ failure will also continue to rise. Thus, the need for increasing the number and successful survival of patients transplanted has never been more acute.

\* <https://optn.transplant.hrsa.gov/>





# Transplantation *and the* Immune System

Unfortunately, the body's natural response to an organ transplant from another person is to activate the immune system – the body's normal defense against invaders like viruses, bacteria, and cancer cells. The immune system's job is to react to and destroy the foreign object, which in this case is the organ transplant itself. For the transplant to be successful, the immune system must be controlled, which can be done in two ways: 1) long-term drug therapy to block immunity (immunosuppression) or 2) the potential for "retraining" the immune system. Sir Peter Medawar received the Nobel Prize in 1960 for his discovery that the immune system could adapt to tolerate foreign cells and treat them like "self." This process is called immune tolerance and, if achieved routinely in humans, would revolutionize transplantation by preventing the need for life-long medications.

Even though cutting-edge immunosuppressive drugs have helped the transplant community make amazing strides in improving the success of organ transplants, there are still serious drawbacks in the safety of these medications. The toxicity of these drugs can lead to increased risks of cancer, infections, diabetes, bone disease, heart attacks, and strokes. If we could realize Sir Peter Medawar's vision of engineering immune tolerance after transplantation, we could eliminate most or all drugs from the procedure and transform the lives of our patients.

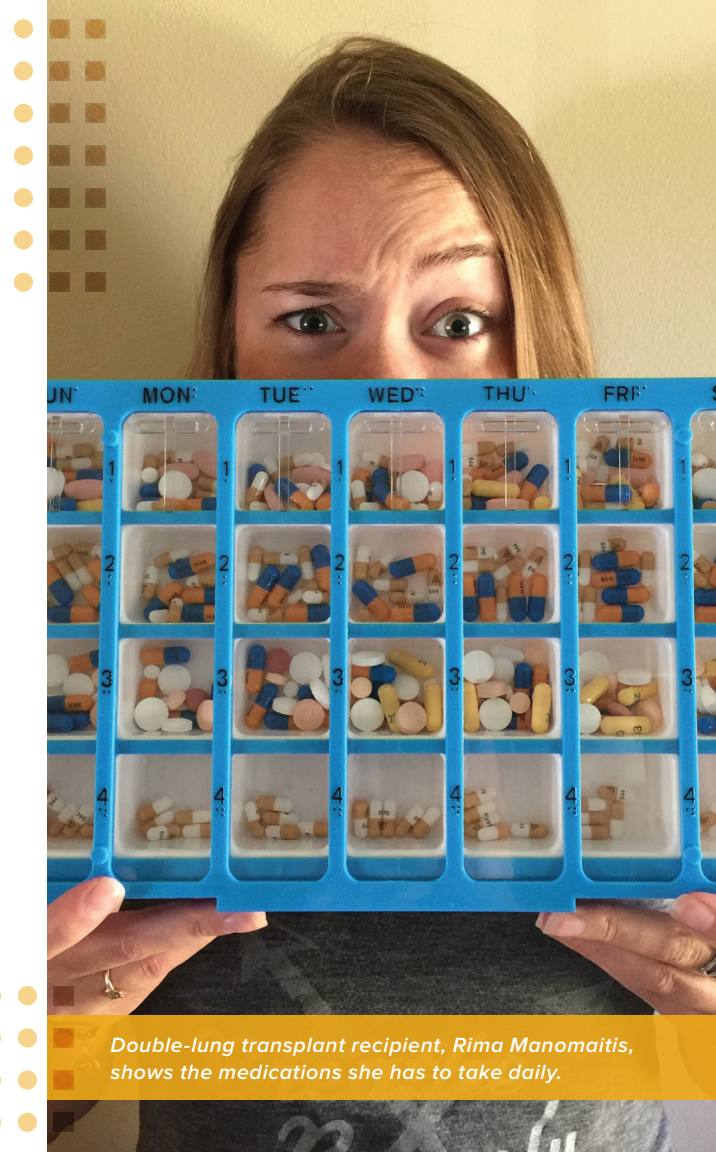




# *The Role of* Immunosuppression in Transplantation

Starting in the 1960s with the introduction of the first generation of immunosuppressive drugs, transplantation advanced by discovering and using powerful drugs to suppress the immune response to transplants. In the early 1980s, the approval of cyclosporine marked the second generation of antirejection drugs. Organ rejection rates were immediately reduced from over 50 percent in the first year to only 20 percent, and it suddenly became possible to successfully transplant livers, hearts, and lungs. Recognizing the direct link between supporting basic and translational scientific research and the successful development of these new drug therapies is critical to future drug discoveries.

Current research is underway to create a new generation of diagnostic testing that will reveal early signs of transplant rejection caused by ineffective immunosuppressive drug therapy. These tests will alert physicians and patients to problems early enough to intervene, help patients with their drugs, or change therapy, and save the transplants from failure. This work is currently being advanced in part because of NIH funding, but continued support is uncertain.



*Double-lung transplant recipient, Rima Manomaitis, shows the medications she has to take daily.*

## *The Future of Transplantation: Stem Cells*

Scientists are always looking for new discoveries and technology to solve the organ shortage problem and minimize or eliminate the need to take immunosuppressive drugs for life. One potential path for the future of organ transplantation is using human stem cells – the remarkable cells in the human body that can change into any other kind of cell and be used to regenerate or repair damaged tissues and organs – in transplantation. If a person's own cells are used to generate a new organ, the immune system won't see them as foreign cells, and will not reject them.

## *The Future of Transplantation: Organ Perfusion Systems*

By integrating various existing and new technologies, transplant scientists have developed an organ perfusion system that keeps donor lungs alive outside of the body for extended periods of time. This technological advancement has also made it possible to apply gene or stem cell therapies to repair, regenerate, and enhance the functionality of the donor lungs that would otherwise not be suitable for transplantation. Organ perfusion systems for the preservation of kidneys has been used for several years. More recently, this technology has been successfully applied to other organs as illustrated by newer preservation techniques resulting in a nearly 30% increase in the ability of available lungs to be used for transplantation. These exciting approaches to preserving organs can now extend to the liver, heart, and intestines.

## *The Future of Transplantation: Xenotransplantation*

Another option to alleviate organ shortage is xenotransplantation, a relatively new technique that grafts or transplants organs between different species. Enormous progress has been achieved in the last few years in the development of genetically-modified pigs specifically for human transplantation. For instance, pig kidneys can now be transplanted and have been functional for more than one year in primates. Pig hearts have also survived more than two and a half years post-transplant in other animals. While many challenges remain in perfecting the generation of pig organs and tissues suitable for clinical use, the future is bright for organ xenotransplantation.

## *The Future of Transplantation: Building New Organs*

A new paradigm in transplantation that has recently been discovered is building organs-on-demand. Current efforts are aiming to produce entire organs using 3D bioprinting systems or by growing organs in the ex vivo perfusion systems – a system that prepares donor lungs outside the body for transplantation. Recent experimental work in organ bioengineering suggests an enormous potential of this technology for future bio-fabrication of organs-on-demand, made from a patient's own cells, effectively eliminating the need for lifelong drugs to control organ rejection.





*Rosie Vargas is a two-time liver transplant recipient. The first was in 2014 and the second in 2018.*

# Transplantation *Needs Your Support*

In 2018, there were over 36,000 organ transplants performed in the United States. These transplants dramatically improve and save the lives of chronically ill patients. However, the facts behind organ transplantation are sobering. Currently, close to half of all transplanted organs will fail within 10 years. Patients will either succumb to their original disease or require a second transplant – a much more challenging, risky procedure. Transplantation should not be therapy for a few short years, but rather for a lifetime.

*“We dream of our daughter going to her first day of kindergarten, graduating high school, getting married and starting a family. We have the same goals and dreams for our child that every parent does, and hope with her second liver, we will see our daughter grow into a woman and have the life she deserves.”*

“Rosalina ‘Rosie’ Vargas was born with a rare metabolic disease that put her at risk of brain damage, coma, and even death. Rosie received a living donor liver transplant in 2014, but due to a blood clot and severe case of rejection, she needed a second transplant. Our prayers were answered on July 21, 2018, when the selfless and generous gift of a second liver from a deceased donor was given to our little girl.

People do not think about organ donation until it affects their family. You are six times more likely to need a transplant than to become an organ donor. Please become a registered organ donor and inform your family of your wishes. If you are ever faced with that painful decision for a family member ...remember Rosie.”

Sarah Vargas  
– Mother to Rosie

• **1944**

Peter Medawar and Frank Burnet show that rejection of a transplant is based on immunologic factors.



• **1954**

Joseph E. Murray performs the first successful kidney transplant between identical twins at the Peter Bent Brigham Hospital in Boston.



• **1958**

The first human leukocyte antigen is discovered leading to the birth of tissue typing.



• **1967**

The first successful liver transplant is performed by Thomas Starzl at the University of Colorado Health Sciences Center. The first successful heart transplant is performed by Christian Bernard in Cape Town, South Africa. Soon after, Norman Shumway performs the first U.S. heart transplant at Stanford University.



• **1970**

Cyclosporine, a compound produced by fungi, is found to suppress the immune system and shown to prevent the rejection of transplanted organs. In 1983, cyclosporine is approved by the FDA for general use ushering in a new era in the field of transplantation.



• **1982**

The first artificial heart, the Jarvik-7, is implanted at the University of Utah. The American Society of Transplant Physicians (ASTP) is founded and opened to physicians and health professionals interested in transplantation medicine and biology.



• **1983**

Successful transplantation of a single lung.



• **1986**

Successful transplantation of double lungs. OKT3, the first monoclonal antibody approved for clinical use in humans, is approved by the FDA to reduce acute rejection. An automated method for islet isolation is developed allowing the collection of sufficient numbers of islets for transplantation.





• **1988**

Successful intestine transplants performed. The first successful split-liver and living donor liver transplants are performed.



• **1994**

New immunosuppressants including Prograf, Cellcept (1995), and Sirolimus (1999) are approved.



• **1998**

The first successful hand transplant is performed, leading the way for the replacement of limbs. The ASTP is renamed The American Society of Transplantation (AST).



• **2005**

The first partial-face transplant takes place.



• **2008**

Recipients of renal allografts receive hematopoietic cell transplants, in two studies (Harvard and Stanford) and are successfully weaned off immunosuppression.



• **2010**

The first full-face transplant takes place.



• **2014**

The AST Research Network is established by the AST to foster transformative, multidisciplinary transplantation and immunology research opportunities.

• **2011**

A patient receives a new trachea made from a synthetic scaffold and his own stem cells. FDA approves the CTLA-4 molecule Belatacept, a ground-breaking antirejection therapy that increases graft survival while significantly limiting the toxicity associated with standard immunosuppressive regimens.



• **Next**

The field of transplantation is positioned to discover new drugs and engineer new biological molecules, more so than ever before.

## *Expanding Research Through Collaboration*

Since 1995, the AST has invested millions of dollars to spur innovative research that dramatically enhances the field of organ transplantation. To support these efforts, the society established the AST Research Network. Among its many goals, the Network seeks to elicit novel topics and collaborative opportunities from its partners in both industry and academia that are critical to advancing the science and practice of research in transplantation.

The AST Research Network provides opportunities for scientists to collaborate by learning and building on their collective strengths, expanding their knowledge of cutting-edge techniques, and growing their professional networks. With the potential of future government and industry funding limiting the research and discovery that is necessary to advance the field, academic and industry partnerships offer investigators a new and different environment for scientific collaboration and research. The AST Research Network is designed to help foster and create new partnerships that could transform the future of transplantation.



## *AST Research Grant Recipient*

*"The AST grant has been helpful to me in so many ways. Soon after receiving the grant, it was announced and acknowledged at several faculty meetings here at Cleveland Clinic. It gave me credibility among my peers and department leadership that I had promise in clinical research as a physician investigator. It also gave me the self-confidence to continue to ask tough research questions and pursue the clinical scientist pathway."*

Wayne M. Tsuang M.D., M.H.S.

– 2017 Clinical Science Faculty Development Grant Winner

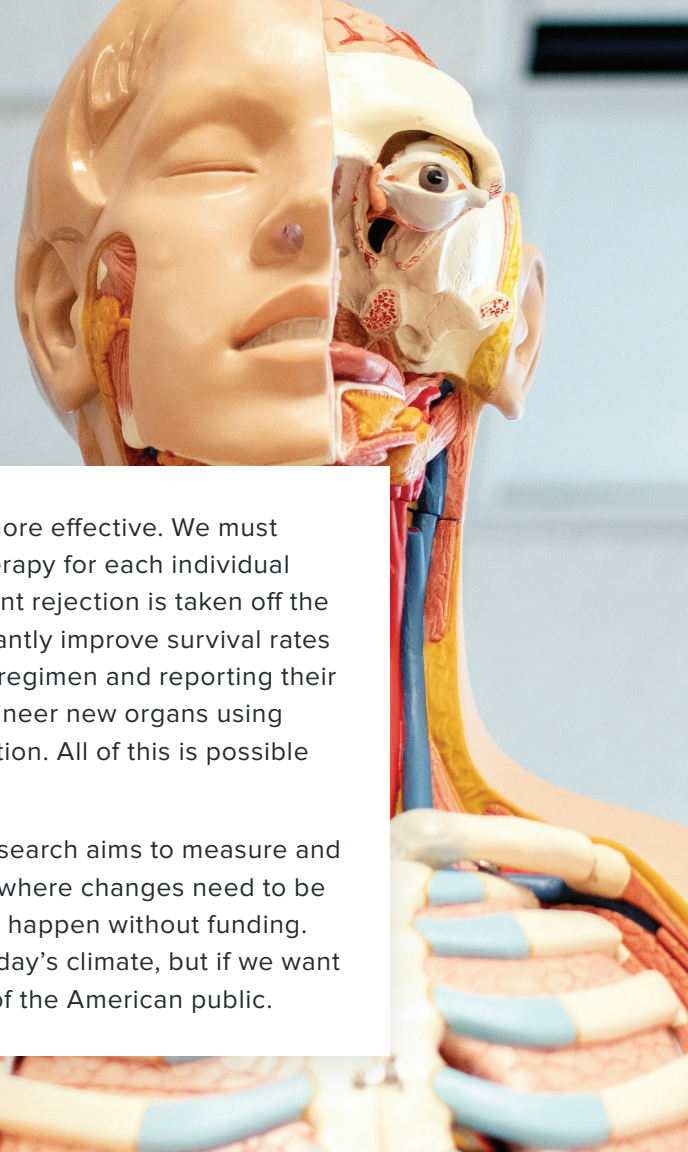
"Improving Access to Lung Transplant  
with Broader Geographic Sharing"



# *Moving* **Transplantation Forward**

We must develop a new generation of medications that are safer and more effective. We must develop new tests to help doctors monitor and optimize medication therapy for each individual patient. Moreover, we must strive to develop strategies so that transplant rejection is taken off the table forever. It's possible to develop new mobile apps that will significantly improve survival rates by directly engaging patients in managing their prescribed medication regimen and reporting their own medical data or health observations daily. It's also possible to engineer new organs using stem cells that have been genetically modified to suppress organ rejection. All of this is possible through continued and expanded research.

Supporting research means many different things. Clinical outcomes research aims to measure and monitor the success of transplantation practices. This research tells us where changes need to be made to increase the value of our efforts. But continued research won't happen without funding. Gaining the funding needed for transplant research is challenging in today's climate, but if we want to improve outcomes for transplant patients, we will need the support of the American public.





## *Get Involved:* **Advocate for Transplantation Research**

To learn more about the  
Transplant Community Summit,  
visit: [power2save.org/tcs](https://power2save.org/tcs)

The AST is a respected voice for the transplant community on Capitol Hill, within the Executive Branch, Federal Agencies, and in many state capitols and legislatures. These governmental agencies dictate and have direct oversight over most aspects of transplant patient care and medical research.

The AST maintains a strong bipartisan and bicameral presence to educate, cultivate, and mobilize support for the Society's public policy agenda. Members of Congress, their staff, and senior HHS officials know the Society well and work with its members and the Washington, D.C., government relations staff daily.

Through various efforts, the AST has represented the interests of patients, physicians, and scientists in all solid organ transplantation specialties. We know that you are also passionate about ensuring future access to essential medicines, insurance coverage, and the best care possible. We also know that advocating for your rights is important, so important that the AST devotes one of its four strategic goals toward advancing its patient-focused advocacy program. For more information on how you can get involved in advocating for organ transplantation, email AST at: [info@power2save.org](mailto:info@power2save.org).

In 2017, the AST hosted its first Transplant Community Summit, a forum created to bring all those that have been affected by transplant together to learn, connect, and share in Washington D.C. In 2018, the AST partnered with the Transplant Games of America to host its Summit, and was well received. The AST plans to continue to engage the transplant community through advocacy and educational opportunities.





*The AST President and staff were joined by kidney candidates and recipients on Capitol Hill in October, 2018.*



*"I have felt for some time that the transplant community has been underserved in the public eye. As such, it has been a tremendous privilege for me to serve with AST and I am excited about the increasing role that our Society can play in patient support, education, and advocacy. Moreover, my hope is that AST can expand its efforts to support research to improve both access to transplantation and improved patient and organ outcomes".*

Ronald G. Gill, Ph.D.

– AST Past President and Scientific Director at the Colorado Center for Transplantation Care, Research and Education

# AST's *Transplant Community*

There are other ways to become involved with the AST. The transplant community – recipients, living donors, and caregivers – are invited to share their transplant journey. The collection of these stories, and a myriad of patient videos, is housed on AST's community-focused website, Power2Save. Power2Save is an initiative created by the AST dedicated to increasing public awareness around the importance of funding transplant research, donating organs, and advocating for transplant health.

Power2Save aims to provide comprehensive and reliable resources for transplant recipients, living donors, caregivers, and those waiting for a transplant. It reaches thousands of recipient families, the medical community, individual advocates, and registered donors. Companies who support Power2Save programming allow AST to continue to educate the public on these important topics.

If you wish to share your story via AST's Power2Save platform, visit: [power2save.org](https://power2save.org)



To learn how you can support Power2Save, visit: [power2save.org/get-involved/ways-to-help/](https://power2save.org/get-involved/ways-to-help/)





# Patient Story

*"A summer Saturday in 2015 began just like any other, but a voicemail I received that day changed my life forever. The next day, I received the gift of life - a working kidney - from a deceased donor at George Washington University Hospital, and my six years as a dialysis warrior came to a joyful end.*

*June 28<sup>th</sup> marks my three-year 'kidneyversary' and Hercules, my transplanted kidney, is still performing like his namesake. Just like in most relationships, we've hit a few rough patches, but life as a kidney transplant recipient, all in all, has been amazing.*

*I live in Maryland, and as I write this, I'm traveling to a dialysis patient education event in New York City to talk about how transplant has changed my life for the better. I also competed in the Transplant Games of America in track and field in 2018, and wouldn't have been able to do it without Hercules's help. I think that speaking with dialysis patients about getting listed for a transplant is one of the best ways I can pay my blessings forward. The best part of the journey has been the friends I have made along the way, and that would not have happened without my transplant either. I wouldn't trade the last three years for anything!"*

David White

— Kidney Transplant Recipient, 2015



*Congresswoman Jamie Herrera Beutler meeting members of the community at the 2017 Transplant Patient Summit.*



# About the AST

The American Society of Transplantation (AST) was founded in 1982 and is an organization of more than 3,900 professionals dedicated to advancing the field of transplantation and improving patient care by promoting research, education, advocacy, and organ donation.

The society is the largest transplant organization in North America and is recognized as the premier society for transplantation. AST members represent the comprehensive transplant team taking care of organ transplant candidates and recipients every day. Other transplant organizations, policy makers, regulatory agencies, payors, academic institutions, and the general public look to the AST for guidance, research, and resources related to transplantation.

*The AST would like to thank the following for their contributions to this brochure: Ron Gill, PhD, FAST, and Alejandro Soto-Gutierrez, MD, PhD.*

