

Precision Autoimmunity Initiative

DISCOVERING NEW THERAPEUTICS FOR THE ENIGMA OF AUTOIMMUNE DISEASE



WILLIAM ROBINSON, MD, PHD

*Chief, Division of Immunology
and Rheumatology*

*Professor of Medicine, Immunology
and Rheumatology*

William Robinson, MD, PhD, has spent his entire career studying the immune system and treating patients with autoimmune and rheumatic diseases.

His lab investigates the molecular mechanisms underlying autoimmune and rheumatic diseases and develops therapies to treat these conditions, with a focus on rheumatoid arthritis, multiple sclerosis, and systemic lupus erythematosus. His team performs translational research with the goal of rapidly converting discoveries made at the bench into practical patient care tools and therapies.

As the cornerstone of the body's health maintenance and disease prevention mechanisms, the immune system is remarkably effective at protecting us against the millions of pathogens that threaten us daily. But when the immune system is compromised, as it is with autoimmune illnesses, it begins attacking the very systems it is intended to protect—the body's own organs, tissues, and cells.

Autoimmune illnesses can strike at any age, and often impair people during their most productive years. These disorders are chronic and often debilitating, and their impact on individuals, families, and society is devastating. It is estimated that five percent of the population suffers from one of 80 different autoimmune diseases, and the prevalence of these disorders is rising.

Because symptoms can involve many body organs, patients often spend months to years visiting doctors across multiple specialties before an accurate diagnosis is made. For many patients, initial symptoms are intermittent and unspecific until the disease becomes more established and causes damage to specific organ systems. Physicians must rely on a clinical assessment, rather than a definitive laboratory test, to diagnose the vast majority of autoimmune diseases.

Autoimmune disorders including rheumatoid arthritis, systemic lupus, multiple sclerosis, and inflammatory bowel disease are quite common, while others such as autoimmune hepatitis, scleroderma, myasthenia gravis, and myositis are more rare. But they all share two undeniable traits—their cause is unknown and their cure is incomplete.

DECIPHERING THE ORIGIN OF AUTOIMMUNITY

Stanford immunologist William Robinson, MD, PhD, has long been frustrated by the lack of understanding of the origins of autoimmune diseases and the inability to treat their root cause.

“Ninety-eight percent of autoimmune diseases occur with no known cause,” says Dr. Robinson, chief of the Division of Immunology and Rheumatology at Stanford University School of Medicine. Dr. Robinson has been studying the immune system his entire career. In May of 2019, he and research associates at Stanford uncovered new mechanisms by which the immune system mediates the development of rheumatoid arthritis, one of the world's most common autoimmune causes of joint pain and immobility. The work of the Robinson lab was also pivotal in the discovery of a comprehensive micro-array test used to diagnose and tailor therapies for rheumatoid arthritis, multiple sclerosis, and other autoimmune diseases.

“We must first discover how and why autoimmune disorders develop, and then translate that knowledge into effective treatments,” he says. “Gaining an understanding of the molecular mechanisms underlying these diseases is vital to the development of new diagnostic tests to improve the precision and speed of diagnosis, as well as to identify targets for next-generation therapeutics.”

NEXT-GENERATION TREATMENTS ARE NEEDED

Treatment is equally non-specific. Today, physicians rely on a number of FDA-approved medications to treat patients with autoimmune disorders. Current therapies, which modulate the immune system, only serve to slow the progres-

“Autoimmune diseases occur with no known cause. Gaining an understanding of what causes these diseases is vital to the development of next-generation, targeted therapies that will more effectively treat, and even potentially cure, autoimmune diseases.”

— WILLIAM ROBINSON, MD, PHD

sion of the disease or mask its symptoms. They generally do not treat the underlying cause, and almost universally do not cure the disease. When patients stop taking prescribed medications, their symptoms often re-emerge.

Some of these therapies work by blocking a specific signaling molecule or depleting a certain type of cell. Others work by globally suppressing the entire immune system. Further, each medication is only effective in a subset of patients, and few patients achieve remission and complete relief of their symptoms. Finding the right treatment frequently involves a long trial-and-error period, which can be a devastatingly slow process for patients suffering from active and debilitating autoimmune disease. Long-term use of immunosuppressant medications can also lead to serious, sometimes fatal, side effects. Without knowing the molecular cause of the disease in individual patients, there is no way to know which therapeutic option to use for each patient.

“We are essentially operating in the dark,” says Dr. Robinson. “If we can gain a thorough understanding of the mechanisms underlying these diseases, we can leverage this information to develop more effective diagnostics and therapeutics that would transform care for a large population of patients.”

LEVERAGING STANFORD’S TRADITION OF INTERDISCIPLINARY INNOVATION AND COLLABORATION

Stanford Medicine is creating the **Precision Autoimmunity Initiative** to bring investigators from multiple disciplines together to achieve two key goals—first, to molecularly define the subtypes of autoimmune diseases, and second, to create next-generation therapeutics that target specific pathways, rather than globally suppressing the entire immune system. By bringing basic and translational scientists together with clinicians in the field, the proposed initiative promises to speed up the pace of translation from discoveries in our labs to clinical care at the bedside.

The program leverages Stanford Medicine’s collaborative approach to research and innovation, using new technologies developed at Stanford to understand and treat autoimmune diseases.

The Stanford Institute for Immunity, Transplantation and Infection (ITI) provides a framework for interdisciplinary research, pooling the talents of immunologists, pathologists, microbiologists, infectious disease specialists, bioinformaticists, autoimmune disease experts, surgeons, scientists, and clinicians to focus their efforts on a shared goal—to understand and ultimately control how the immune system defends the body at the molecular and cellular levels. Cross-disciplinary ITI teams are striving to elicit a deeper understanding of normal immune function, autoimmunity, and anti-pathogen immune responses.

“By accelerating the pace of research in the field of autoimmunity, we are striving to refine clinical diagnosis of autoimmune diseases, and improve our ability to define the various mechanisms driving these diseases to inform treatment selection and develop new therapeutic targets,” says Mark Davis, PhD, director of the ITI. Dr. Davis is a pre-eminent researcher whose work focuses on how the immune system functions both in health and in autoimmune disease.

Rheumatoid arthritis of a joint, as seen using an hematoxylin and eosin stain and microscopy.

The Division of Immunology and Rheumatology at Stanford provides outstanding clinical care for patients suffering from a spectrum of immune and rheumatic diseases. Its physicians and physician-scientists bring the latest discoveries and pioneering research to patients, while educating the next generation of clinicians and investigators in the diagnosis, treatment, and exploration of autoimmune diseases.

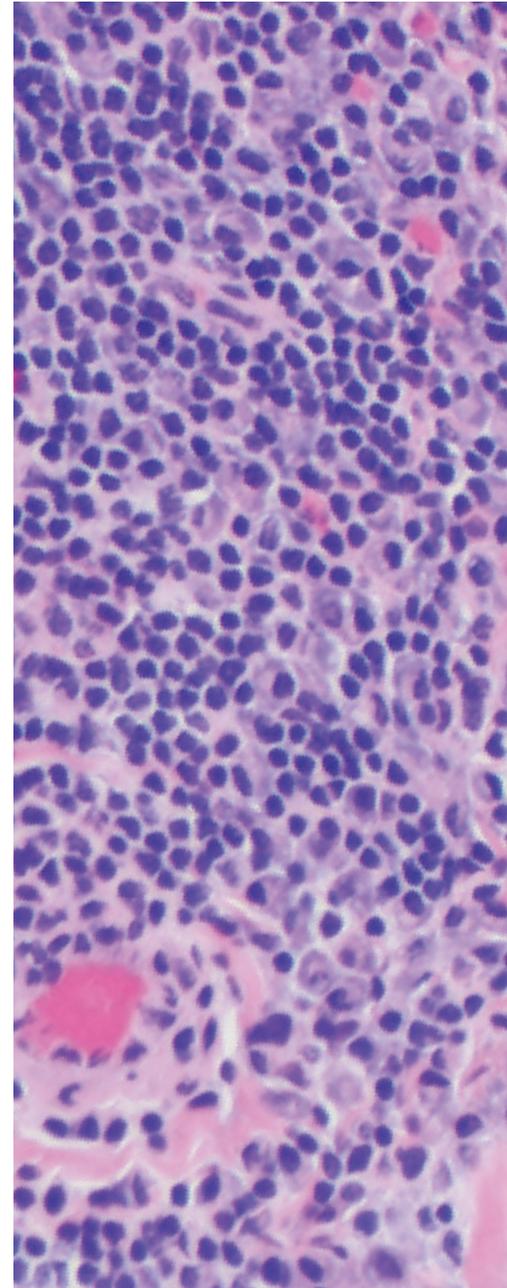
Under Dr. Robinson's leadership, the division has assembled a collaborative group of physicians and physician-scientists who employ molecular biology, genomics, epigenetics, high-throughput sequencing, proteomics biomarker identification, and clinical trials to gain a better understanding of how protective immunity turns into damaging autoimmunity. The goal of these cross-collaborative efforts, he says, is to understand the mechanisms underpinning the initiation and progression of autoimmune diseases, and to use this information to develop the next generation of targeted therapeutics that will effectively treat and even cure autoimmune diseases.

The Stanford Human Immune Monitoring Center (HIMC) supports all of these research efforts by providing standardized, state-of-the-art immune monitoring tests at the RNA, protein, and cellular levels, and offers archiving, reporting, and data mining support for clinical and translational studies. Using the latest generation mass cytometry system, CyTOF, the HIMC can analyze a multitude of immune parameters from a single blood sample. CyTOF is a transformative technology that is instrumental in driving groundbreaking discoveries in immunology by enabling researchers to deeply profile protein biomarkers from cells and tissues at single-cell resolution.

JOIN US IN ACCELERATING THE PACE OF DISCOVERY

Thank you for your interest in autoimmune disease research and discovery. There are opportunities to fund new and ongoing research at every level—through seed grants for young investigators exploring high-risk novel ideas, interdisciplinary funding for collaborative projects, and grants for large-scale clinical trials conducted by established researchers. Funding will also help support data sharing, and the creation of patient registries and biorepository banks that can be mined for new discoveries.

Your philanthropic investment in this groundbreaking work can greatly advance our ability to understand the immune system and rapidly develop and employ new therapeutics to improve the lives of the millions of people suffering from autoimmune diseases.



CONTACT US

To find out more about how your philanthropy can make a difference in accelerating the pace of discovery in autoimmune diseases, please contact:

Anne Marie Krogh

Senior Director of Major Gifts

Medical Center Development

650.721.6929 | amkrogh@stanford.edu

medicalgiving.stanford.edu