

JUST THE FACTS

TO DATE, MORE THAN

80

autoimmune diseases have been identified¹

MORE THAN

23.5M

Americans are affected by an autoimmune disease¹

MORE THAN

75%

of people with autoimmune diseases are women²



IN PARTNERSHIP WITH

Help Us Solve
The Cruel Mystery
LUPUS[™]
FOUNDATION OF AMERICA

MEDICINES IN DEVELOPMENT FOR AUTOIMMUNE DISEASES

A REPORT ON AUTOIMMUNE DISEASES

More Than 300 Medicines in Research Pipeline for Autoimmune Diseases

When working correctly, the body's immune system works to protect and defend the body from infections and diseases. For reasons not fully understood, the immune system in some people becomes unable to tell the difference between normal and unhealthy cells. When this occurs, the immune system goes into overdrive and begins to attack the body's normal, healthy organs and tissues, causing deterioration and destruction. This is called autoimmune disease. Today, more than 80 autoimmune diseases have been identified. Many more diseases are thought to be autoimmune but have not been scientifically identified as such, and others are considered to be autoimmune-related conditions.

Although researchers do not know the exact cause of autoimmune diseases, progress is being made to better understand potential factors that may be involved. Scientists have discovered that autoimmune diseases tend to occur in members of the same family, suggesting a genetic component, and are more common in women than in men. In autoimmune diseases, environmental elements, such as certain foods, chemicals or even physical trauma can trigger the immune system to attack the body, but often the cause for this misrecognition and reaction is not clear.

America's biopharmaceutical research companies are responding to the needs of patients with autoimmune diseases by working to develop new innovative approaches to treatment. Today, biopharmaceutical companies have 311 medicines and vaccines³ for autoimmune diseases in clinical trials or awaiting review by the U.S. Food and Drug Administration (FDA). The medicines in development include:

- ▶ 76 for autoimmune types of arthritis, including juvenile idiopathic arthritis, which affects the majority of the nearly 300,000 children with arthritis, and rheumatoid arthritis, which affects 1.5 million people in the United States.⁴
- ▶ 58 for inflammatory bowel disease, which includes Crohn's disease and ulcerative colitis, and affects 1.6 million Americans.⁵
- ▶ 39 for lupus, which affects an estimated 1.5 million Americans, with more than 16,000 new cases reported annually.⁶
- ▶ 34 for type 1 diabetes, previously known as juvenile diabetes, with approximately 1.25 million American children and adults having the disease.⁷
- ▶ 32 for multiple sclerosis, which is diagnosed most often between the ages of 20 and 50, and diagnosed at least two to three times more often in women than men.⁸

Medicines in the Pipeline for Autoimmune Diseases

The 311 medicines in development for patients with autoimmune diseases use exciting new approaches aided by the growing scientific understanding of many of these diseases. In addition, medicines already approved to treat one autoimmune disease are being studied for applicability in treating additional diseases. Some of the medicines in the pipeline for autoimmune diseases include:

LUPUS (SYSTEMIC LUPUS ERYTHEMATOSUS)

A monoclonal antibody medicine in development for the treatment of lupus acts against a protein in the body that is thought to play a key role in the development of the disease. The protein helps regulate the activity of the immune system. By inhibiting the activity of the protein, the medicine is expected to halt the development of lupus.

PSORIASIS

Several monoclonal antibody medicines are in development for psoriasis that target a specific subunit of a receptor gene. The monoclonal antibodies bind

to and neutralize the gene, which is thought to play a key role in autoimmune inflammatory processes that have been linked to many chronic autoimmune diseases, including psoriasis.

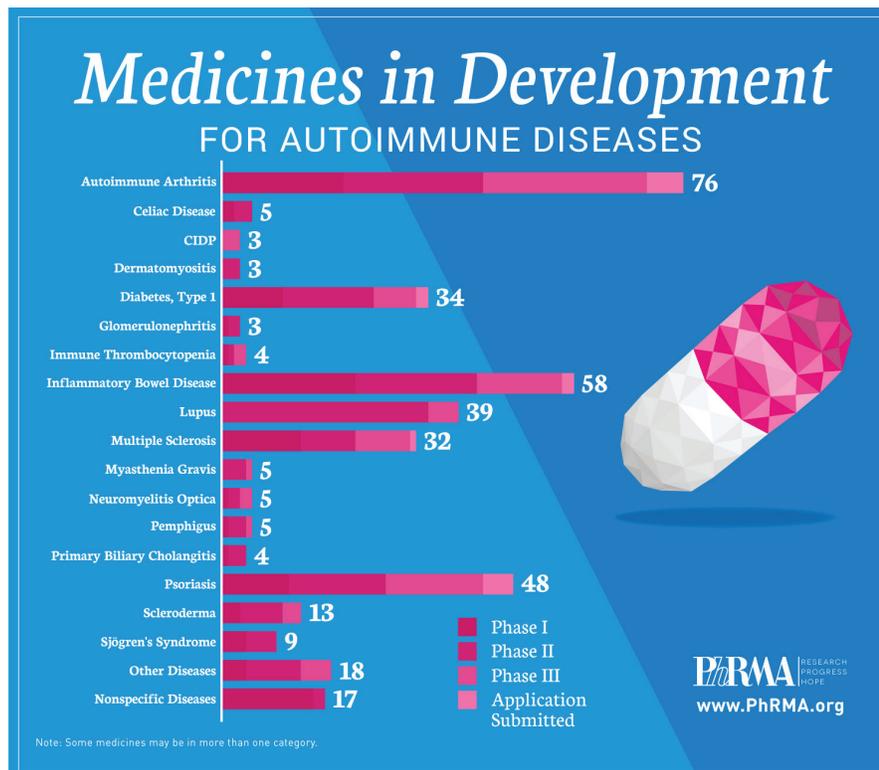
SJÖGREN'S SYNDROME

A monoclonal antibody medicine in development for the treatment of Sjögren's syndrome binds to a protein in the body and prevents its interaction with stimulators on immune cells called activated T-cells. Preventing the interaction between the protein and the stimulator is thought to prevent increased immune cell responses associated with autoimmune diseases, such as Sjögren's.

Autoimmune-related disorders and co-occurring diseases

Because autoimmune diseases can share common genetic and immunological links, it is not uncommon for a person with one autoimmune disease to be diagnosed with another autoimmune disease. According to the Gluten Intolerance Group, people with celiac disease are at a higher risk for developing other autoimmune diseases, such as type 1 diabetes and autoimmune thyroid disease.

In addition, several diseases are related to autoimmunity or caused by an autoimmune disease but are not themselves autoimmune diseases. For example, an immune response to a virus can cause damage to the heart called myocarditis. An inflammation of the blood vessels, called vasculitis, can also be autoimmune-related. Mastocytosis has also been implicated in various autoimmune diseases.



“...AUTOIMMUNE DISEASES ARE BEST RECOGNIZED AS A FAMILY OF RELATED DISORDERS THAT MUST BE STUDIED TOGETHER AS WELL AS INDIVIDUALLY.”

NIH BIENNIAL REPORT,
2012-2013

For a complete list of the 311 medicines in development, please visit:
<http://phrma.org/sites/default/files/pdf/medicines-in-development-drug-list-autoimmune-diseases.pdf>

Stacey Kozel: A Personal Story Shared by the Lupus Foundation of America

Lupus is a mysterious and complicated disease that is difficult to diagnose and challenging to treat. It can damage any part of the body, including the skin, joints, and internal organs. It is a disease of flares over periods of time when symptoms are particularly active.

Lupus is a cruel mystery that ravages different parts of the body. It is difficult to diagnose, hard to live with and a challenge to treat. Lupus is debilitating and destructive and can be fatal.

It can strike anyone at any time, but 90 percent of people with lupus are women, and women of color are two to three times more likely to develop the disease.

Research on lupus remains underfunded relative to its prevalence and public health impact. Lupus is the prototypical autoimmune disease. While most other autoimmune diseases affect one organ system, lupus affects multiple organs and tissues in the body. Medical research on lupus may provide clues to the causes of this immune dysregulation and ultimately find cures for people with lupus as well as other autoimmune diseases.

It took more than 50 years for a new drug to be approved for lupus and an arsenal is needed to treat the complexities of the disease.

Despite its widespread prevalence, about two-thirds of the public have little or no knowledge of lupus.

Lupus is a disease of flares – unpredictable health crises that can strike anytime – which make it a challenge to live with and can greatly impact an individual's quality of life. Stacey Kozel is an example of a lupus warrior who works daily to overcome the challenges presented by lupus and persevere.

STACEY KOZEL:

POSSIBILITIES ARE ENDLESS

In March 2016, 41-year-old Stacey Kozel set out to trek the estimated 2,190-mile

Appalachian Trail, despite not being able to walk because of complications from lupus. Stacey uses leg braces that walk for her by activating the muscles and bones in her legs through the movement of her hips and sensors at the knees and ankles that exchange information to mimic walking.

Since her diagnosis at age 19, Stacey has been in and out of the hospital. Lupus affects Stacey's central nervous system and prevents her heart and lungs from functioning normally. The weakening of her muscles makes it hard for her to breathe. She lost her ability to walk several times before finally ending up in a wheelchair in March 2014.

With the help of a powered wheelchair and leg braces, Stacey finished college and graduated with honors. This accomplishment was the first glimpse of the endless possibilities ahead of her.

Becoming paralyzed served as a wake-up call for Stacey, and she made a commitment to getting out of the hospital bed and back to life. She discovered leg braces that could walk for her and allow her to push the limits of possibility.

Thru-hiking the Appalachian Trail, or covering the entire distance within one year, is a mammoth feat. Typically, hikers take approximately five million steps. The trail stretches across 14 states, from Springer Mountain in Georgia to Mount Katahdin in Maine. The ascents and descents produce a total elevation gain roughly equivalent to climbing Mount Everest 16 times.



Most thru-hikers do not finish. Most thru-hikers do not have to deal with the additional challenges that Stacey faces because of her paralysis.

Stacey says the worst day on the trail is far better than the best day in the hospital. Like Stacey, many people with lupus refuse to let the disease control their lives.

Stacey does not know when the next flare will occur, and each flare tends to be more severe than the last. She takes countless medications that have horrible and unpredictable side effects. The challenges are beyond what is visible and that is true for everyone who deals with lupus.

STACEY'S NICKNAME ON THE TRAIL IS "IRONWILL."

HER IRON WILL IS AN INSPIRATION FOR PEOPLE WHO LIVE WITH LUPUS AND EVERYONE WHO BELIEVES IN INFINITE POSSIBILITIES.

Challenges in Diagnosing and Researching Autoimmune Diseases

DIAGNOSING AUTOIMMUNE DISEASES

The diagnosis of autoimmune diseases is challenging for several reasons. A lack of basic knowledge about each disorder and how they are different from each other make it difficult to diagnose patterns, identify treatments and design clinical trials. Researchers are working to gain a better understanding of the causes, underlying biology and factors affecting disease progression of these disorders.

Autoimmune diseases are complex and can share similar symptoms or affect similar parts of the body, making these conditions difficult to diagnose. For example, early symptoms of several autoimmune diseases can include inflammation, achy muscles, fatigue and fever. And, if the skin is affected, it could be one of many autoimmune diseases, such as scleroderma and vitiligo. Additionally, many autoimmune diseases are characterized by symptoms that may occur in acute episodes; these episodes may ebb and change over time, making it difficult to determine the severity of the disease.

COMPLEXITY OF RESEARCH IN AUTOIMMUNE DISEASES

The lack of knowledge regarding the biology of autoimmune diseases makes it difficult to identify targets for clinical research.

Before a new medicine can be approved by the FDA, researchers must demonstrate that the medicine is safe and effective. Evaluating the effects of new medicines in patients is done through clinical trials. Specific measures, called endpoints, are used to evaluate safety and efficacy; however, it is challenging to define viable measures and endpoints to determine how the

disease is progressing and whether a medicine is effective. Clinical trials for autoimmune diseases may also be delayed, as it is challenging to enroll patients with uncertain diagnoses or co-occurring diseases.

In order to accelerate the development of new treatment options, biopharmaceutical researchers work closely with patients and members of the autoimmune disease community to develop innovative ways to assess disease activity. For example, scoring systems, such as the systemic lupus erythematosus disease activity index (SLEDAI) were developed in order to find a way to quantify lupus disease activity so that researchers could measure the impact of new medicines in development. This innovative disease scale encompasses measures that are important for patients, including seizures, psychosis, hair loss and muscle weakness, as well as laboratory testing results, including urinalysis and blood cell levels, that can be disease indicators.

Biological markers, or biomarkers, are also emerging as important new ways of detecting disease and monitoring disease progression. Biomarkers are a measure or physical sign that can also be used to assess how the body is functioning. In patients with autoimmune diseases, these measures can indicate when the immune system is malfunctioning. Biomarkers may be used to diagnose a disease earlier, before irreversible damage has been done, and help determine if a medicine being evaluated in clinical trials is effective.

Advances in Treatment: Then and Now

MULTIPLE SCLEROSIS

THEN: One decade ago, treatments were limited to a handful of injected and infused medicines that resulted in painful site reactions and challenging side effects for some patients.

NOW: Patients have greater and more convenient treatment options with fewer side effects, including a number of oral treatment regimens to help reduce relapses, prevent disease progression and improve overall quality of life.

RHEUMATOID ARTHRITIS

THEN: Treatments for rheumatoid arthritis were generally effective at reducing joint inflammation but were limited to treating the symptoms of the disease, allowing for a steady, rapid progression from disease onset to disability.

NOW: Biologic disease-modifying anti-rheumatic drugs target the underlying sources of inflammation, which improves physical functioning and prevents irreversible joint damage, making disease remission possible.

Sources:

1. Office of Women's Health, U.S. Department of Health and Human Services
2. American Autoimmune Related Diseases Association
3. Number of medicines obtained through government and industry sources, and the Springer "AdisInsight" database. Current as of August 12, 2016.
4. Arthritis Foundation
5. Crohn's & Colitis Foundation of America
6. Lupus Foundation of America
7. American Diabetes Association
8. National Multiple Sclerosis Society