BioTechniques In Focus

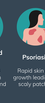
Sino Biological

Autoimmune diseases:
the era of targeted treatments

Autoimmune diseases are diverse and complex diseases involving **immune cells**, **cytokines** and **protein kinases**. In recent years, significant progress has been made in drug development and **targeted therapies** for autoimmune diseases, especially biologic drugs. These drugs have primarily focused on **monoclonal antibodies** and **small molecule inhibitors**. This infographic provides a comprehensive overview of autoimmune diseases, covering common types, therapeutic targets, drug development, biomarkers, and their applications, while also highlighting Sino Biological's solutions in this field.

Common autoimmune diseases

Rheumatoid Arthritis
Chronic joint inflammation causing pain and deformity



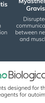
Psoriasis
Rapid skin cell growth leading to scaly patches

Multiple Sclerosis
Damage to the protective covering of nerves, disrupting signals

Ulcerative Colitis
Chronic inflammation and ulcers in the colon and rectum

Type 1 Diabetes
Destruction of insulin-producing cells in the pancreas

Lupus Nephritis
Kidney inflammation impairing filtration function



Myasthenia Gravis
Disrupted communication between nerves and muscles

Interstitial Lung Disease
Inflammation and scarring of lung tissue, affecting breathing

Crohn's Disease
Chronic inflammation that can affect any part of the digestive tract

Systemic Lupus Erythematosus
Widespread inflammation affecting multiple systems

Sino Biological's top tip!

Use reagents designed for the study of your disease of interest. We offer a wide range of research reagents for autoimmune diseases, including each of these examples.

Key therapeutic targets

Immune cell proteins

Certain immune cell proteins play a crucial role in the initiation of aberrant immune responses. Targeting these proteins can modulate the behavior of immune cells to suppress excessive immune responses, reduce inflammation and tissue damage, thereby controlling disease progression.

CD20

- Surface marker on B cells
- Targeting CD20 clears B cells, reducing autoantibody production
- Clinically approved example: The monoclonal antibody ocrelizumab has been approved for multiple sclerosis

CD19

- Co-stimulatory molecule on B cells
- Targeting CD19 clears B cells and reduces autoimmune responses
- Clinically approved example: The monoclonal antibody inebilizumab has been approved for neuromyelitis optica

CTLA-4

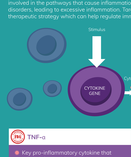
- Inhibitory receptor on T cells
- By binding to CD80/CD86, it suppresses T cell activation and prevents the immune system overactivation.
- Clinically approved example: The fusion protein abatacept has been approved for rheumatoid arthritis

CD 3

- Key component of the T cell receptor complex
- Targeting CD3 modulates T cell function and suppresses excessive immune responses
- Clinically approved example: The monoclonal antibody teplizumab has been approved for type 1 diabetes

Cytokines

Cytokines are proteins secreted by a wide range of immune and non-immune cells, which are involved in the pathways that cause inflammation. They are often overexpressed in autoimmune disorders, leading to excessive inflammation. Targeting cytokines has become an effective therapeutic strategy which can help regulate immune responses and alleviate disease symptoms.



TNF-α

- Key pro-inflammatory cytokine that drives inflammation and tissue damage
- Clinically approved example: The monoclonal antibody adalimumab approved for rheumatoid arthritis

IL-17

- Pro-inflammatory cytokine produced by Th17 cells, driving chronic inflammation and tissue damage
- Clinically approved example: The monoclonal antibody ixekizumab has been approved for plaque psoriasis

BAFF

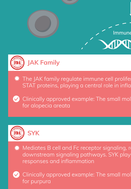
- Key factor for B cell survival and activation, promoting autoantibody production
- Clinically approved example: The monoclonal antibody belimumab has been approved for systemic lupus erythematosus

IL-23

- Key cytokine for Th17 cell differentiation and maintenance, driving chronic inflammation
- Clinically approved example: The monoclonal antibody guselkumab has been approved for plaque psoriasis

Protein Kinases

Kinases play a pivotal role in a number of cellular processes, and through their modulation of inflammatory mediator production, they help regulate immune cell activation, inflammatory responses and signaling pathways. In autoimmune diseases, the function of these kinases can become disrupted, leading to unregulated inflammatory stimulation. Small molecule inhibitors targeting these kinases help control excessive immune activation and reduce inflammation.



JAK Family

- The JAK family regulate immune cell proliferation, differentiation and function by activating STAT proteins, playing a central role in inflammation and immune regulation
- Clinically approved example: The small molecule inhibitor deuruxolitinib has been approved for alopecia areata

SYK

- Mediates B cell and Fc receptor signaling, regulating immune cell function by activating downstream signaling pathways. SYK plays a central role in antibody-mediated immune responses and inflammation
- Clinically approved example: The small molecule inhibitor fostamatinib has been approved for purpura

BTK

- Essential for B cell receptor signaling, promoting B cell activation and antibody production, contributing to autoantibody generation and inflammatory responses.
- Clinically studied example: The small molecule inhibitor tolebrutinib has been studied for treating multiple sclerosis

Sino Biological's top tip!

Skip target isolation and production! Sino Biological offer a range of recombinant targets, cytokines and protein kinases to support autoimmune disease research and drug development.

Biomarkers and Applications

The primary aim of researching biomarkers in autoimmune diseases is to discover markers that change in response to disease progression but then normalize after effective treatment. They play a critical role in diagnosing diseases, predicting outcomes and monitoring treatment responses. They include cytokines, antibodies, and cellular markers, which reflect the immune system's abnormal activity.

Antinuclear Antibodies, ANA

Targets nuclear components, forming immune complexes that activate the immune system and cause inflammation and tissue damage.

Main Diseases

- Systemic Lupus Erythematosus
- Systemic Sclerosis
- Sjogren's Syndrome

C-Reactive Protein, CRP

Acute-phase protein synthesized by the liver in response to inflammation or tissue damage. CRP binds to pathogens or damaged cells, activating the complement system and promoting inflammation and immune clearance.

Main Diseases

- Rheumatoid Arthritis
- Systemic Lupus Erythematosus
- Psoriasis

Interleukin-6, IL-6

Produced by immune cells, IL-6 binds to IL-6 receptors, activating the JAK-STAT pathway and promoting inflammation, immune cell differentiation and acute-phase protein production.

Main Diseases

- Rheumatoid Arthritis
- Castleman disease
- Psoriasis

Complement C3/C4

Central to the complement system, C3 participates in the classical, alternative and lectin pathways, while C4 is involved in the classical and lectin pathways. Upon, they are cleaved into fragments, mediating inflammation and immune clearance.

Main Diseases

- Systemic Lupus Erythematosus
- Lupus Nephritis
- IgA Nephropathy

Sino Biological's top tip!

Improve the reproducibility of your biomarker investigations with our high-quality tools for biomarker analysis and drug discovery, featuring high activity, purity and lot-to-lot consistency.

Techniques for detection

Immunofluorescent antinuclear antibody test

This test involves mixing a blood sample with cells, often HEp-2 cells, whose nuclei are exposed. If ANAs in the sample are present, they will bind to nuclear antigens on the cells. A secondary antibody tagged with fluorescent dye is then added, allowing the ANAs to be viewed through a microscope.

This test is often used to detect ANAs as it is a sensitive test that allows for visualization of present ANAs.

Immunoturbidimetry or nephelometry

These techniques can quantify levels of CRP in a blood sample by measuring the attenuation of light with antigen-antibody complexes.

Either technique can be used for reliable and accurate detection of CRP. Immunoturbidimetry is simple to perform, while nephelometry is more sensitive.

ELISA kit

This technique uses an enzyme-linked antibody to detect the presence of specific biomarkers, such as IL-6 and C3/C4.

This test is often used to detect key biomarkers due to its sensitivity and specificity.

Sino Biological's top tip!

Don't reinvent the wheel! We offer a range of antibodies and ELIZA kits for biomarker studies.

What solutions are available?

Solutions are available to assist with autoimmune disease research and drug discovery. Sino Biological, for instance, offers comprehensive reagents for autoimmune disease research, such as recombinant target proteins, cytokines and kinases, supporting pathogenesis study, biomarker analysis, targeted drug discovery and diagnostic kit development.

Click here to find out more

This infographic was created as part of a BioTechniques In Focus sponsored by Sino Biological.

BioTechniques In Focus

Sino Biological