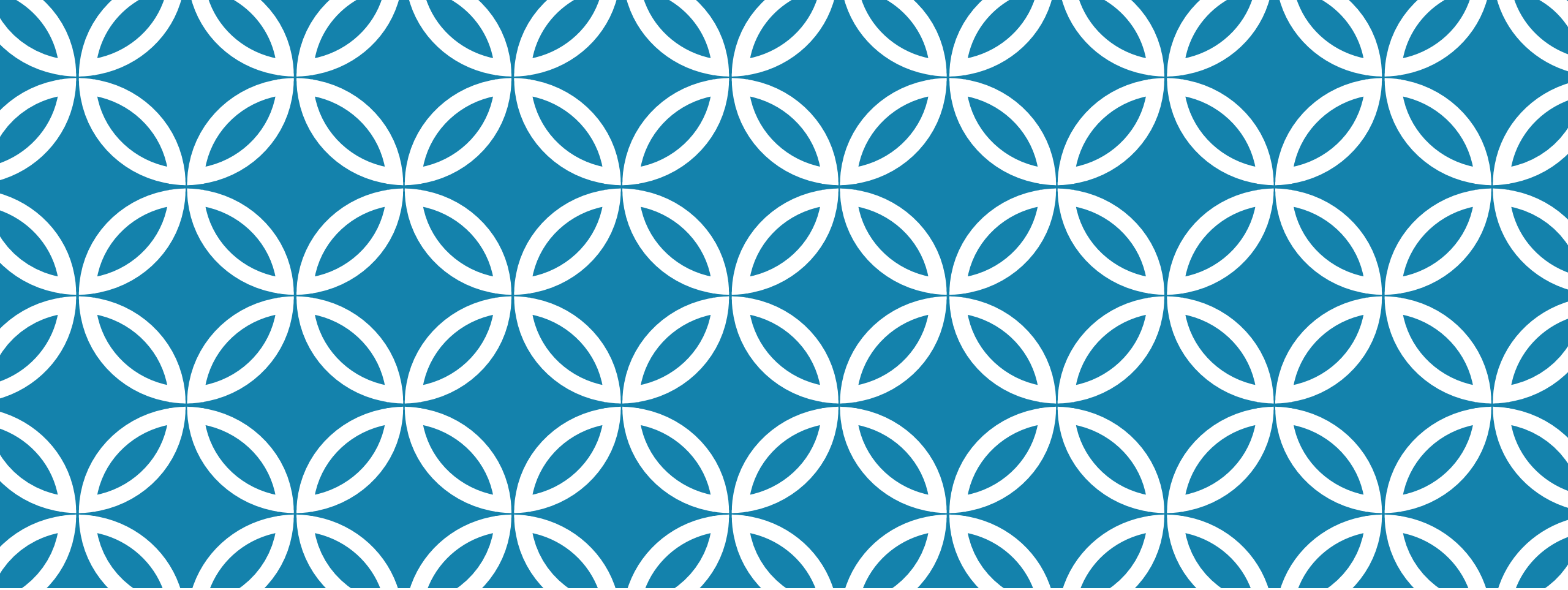

HYPERSENSITIVITY

Hypersensitivity

- undesirable reactions produced by the normal immune system, including allergies and autoimmunity. They are usually referred to as an over-reaction of the immune system and these reactions may be damaging, uncomfortable, or occasionally fatal.
- Hypersensitivity diseases include autoimmune diseases, in which immune responses are directed against self-antigens, or a diseases that result from uncontrolled or excessive responses to foreign antigens.
- Because these reactions occur against antigens that cannot be escaped (i.e. self-antigens) ,hypersensitivity diseases tend to manifest as chronic problems.
- Hypersensitivity reactions can be divided into four types: type I, type II, type III and type IV, based on the mechanisms involved and time taken for the reaction. Frequently, a particular clinical condition (disease) may involve more than one type of reaction.

- On the basis of time required for sensitized host to develop clinical reaction upon reexposure to the antigen, Chase classified them as:

  i. Immediate reaction.

  ii. Delayed reaction

- On the basis of different mechanisms of pathogenesis hypersensitivity reaction classified into 5 types

Differences between immediate hypersensitivity reaction and delayed hypersensitivity reaction

Immediate reaction	Delayed reaction
1. Appears and recedes rapidly	Appears slowly and lasts longer
2. Induced by antigen or hapten by any route	Induced by infection, injection of antigen or by skin contact
3. Circulating antibodies present and responsible for reaction (antibody mediated reaction)	Cell mediated reaction and not antibody mediated
4. Desensitization easy but short lived	It is difficult but long lasting
5. Lesions are acute exudation and fat necrosis	Mononuclear cell collection around blood vessels
6. Wheal and flare with maximum diameter in 6 hours	Erythema and induration with maximum diameter in 24 to 48 hours

- **Type I:** Anaphylactic (Immediate hypersensitivity) reagin dependent, e.g. anaphylaxis, atopy, asthma etc. IgG, IgE and histamine participate in this type of reaction.

- **Type II:** Cytotoxic (Antibody-mediated hypersensitivity), e.g. thrombocytopenia, hemolytic anemia, IgG, IgM and complement take part in this reaction.

- **Type III:** Immune complex or toxic complex, e.g. Arthus reaction, serum sickness, glomeruler nephritisetc. In this reaction IgG, IgM and complement take part.

- **Type IV:** It is delayed type of hypersensitivity in which T cells, lymphokines and macrophages take part, e.g. tuberculin type and contact dermatitis. The antigen activates specifically sensitized CD_4 and CD_8.T cells resulting in secretion of lymphokines.

- **Type V:** It is antibody dependent cell mediate and cytotoxic type of reaction, e.g.autoimmune orchitis in guinea pigs.**Type V** This is an additional type that is sometimes used as a distinction from Type 2.

Autoimmune disease

- **Autoimmune disease** is a condition arising from an abnormal immune response to a normal body part. autoimmune disease develops when your immune system, which defends your body against disease, decides your healthy cells are foreign. As a result, your immune system attacks healthy cells.

- There are at least 80 types of autoimmune diseases, nearly any body part can be involved, common symptoms include low grade fever and feeling tired , Many of them have similar symptoms, which makes them very difficult to diagnose Autoimmune diseases usually fluctuate between periods of remission (little or no symptoms) and flare-ups (worsening symptoms).

- Treatment depends on the type and severity of the condition, treatment for autoimmune diseases focuses on relieving symptoms because there is no curative therapy.

➢The cause of autoimmune disease is unknown. There are many theories about what triggers autoimmune diseases, including:

I. bacteria or virus
II. drugs
III. chemical irritants
IV. environmental irritants
V. You may be more susceptible to developing an autoimmune disease if you have a family member with one.

➢The following are some of the more common autoimmune diseases:

- rheumatoid arthritis: inflammation of joints and surrounding tissues
- systemic lupus erythematosus: affects skin, joints, kidneys, brain, and other organs
- Celiac disease: a reaction to gluten that causes damage to the lining of the small intestine

- pernicious anemia: decrease in red blood cells caused by inability to absorb vitamin B-12
- vitiligo: white patches on the skin caused by loss of pigment
- scleroderma: a connective tissue disease that causes changes in skin, blood vessels, muscles, and internal organs
- psoriasis: a skin condition that causes redness and irritation as well as thick, silver-white patches
- inflammatory bowel diseases: a group of inflammatory diseases of the colon and small intestine
- Hashimoto's disease: inflammation of the thyroid gland
- Addison's disease: adrenal hormone insufficiency
- Graves' disease: overactive thyroid gland
- type 1 diabetes: destruction of insulin producing cells in the pancreas
- autoimmune hemolytic anemia
- some forms of juvenile idiopathic arthritis
- glomerulonephritis
- Graves' disease
- Guillain-Barré syndrome

symptoms of an autoimmune disease

Because there are so many different types of autoimmune disease, the symptoms vary, however, common symptoms are fatigue, fever, and general malaise (feeling ill). Symptoms become wores during flare-ups and less during remission.

Autoimmune diseases affect many parts of the body. The most common organs and tissue affected are:

- joints
- muscles
- skin
- red blood cells
- blood vessels
- connective tissue
- endocrine glands

Autoimmune diseases diagnosed

Usually Immune system produces antibodies against harmful invaders in the body. When you have an autoimmune disease, your body produces antibodies against some of your own tissues, the following tests are used to diagnose an autoimmune disease:

- autoantibody tests: any of several tests that look for specific antibodies to own tissues.
- antinuclear antibody tests: a type of autoantibody test that looks for antinuclear antibodies, which attack the nuclei of cells .
- complete blood count: measures the numbers of red and white cells in blood; when immune system is actively fighting something, these numbers will vary from the normal
- C-reactive protein (CRP): elevated CRP is an indication of inflammation throughout the body
- erythrocyte sedimentation rate: this test indirectly measures inflammation.

autoimmune diseases treated

- Autoimmune diseases are chronic conditions with no cure.
- Treatment involves attempts to control the process of the disease and to decrease the symptoms, especially during flare-ups.
- The following is a list of things you can do to minimize symptoms of the disease:

✓eat a balanced and healthy diet

✓exercise regularly

✓get plenty of rest

✓take vitamin supplements

✓decrease stress

✓limit sun exposure

✓avoid any known triggers of flare-ups

Medical interventions include:

- hormone replacement therapy, if necessary
- blood transfusions, if blood is affected
- anti-inflammatory medication, if joints are affected
- pain medication
- immunosuppressive medication
- physical therapy

systemic lupus erythematosus (SLE)

- The term lupus has been used to identify a number of immune diseases that have similar clinical presentations and laboratory features, but SLE is the most common type of lupus.
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- SLE is a chronic disease , however most people with SLE are able to live a normal life with treatment.
- In this disease, autoantibodies are formed against DNA, histones, nucleolar proteins, and other components of the cell nucleus.
- The disease affects primarily women between ages of 20 to 60 years.

Causes of SLE The exact cause of SLE isn't known, The agent that induces these autoantibodies in most patients is unknown. However, two drugs, procainamide and hydralazine, are known to cause SLE, but several factors have been associated with the disease.

- **Genetics** The disease isn't linked to a certain gene, but people with lupus often have family members with other autoimmune conditions.
- **Environment** Environmental triggers can include:

- ultraviolet rays
- certain medications
- viruses
- physical or emotional stress
- trauma

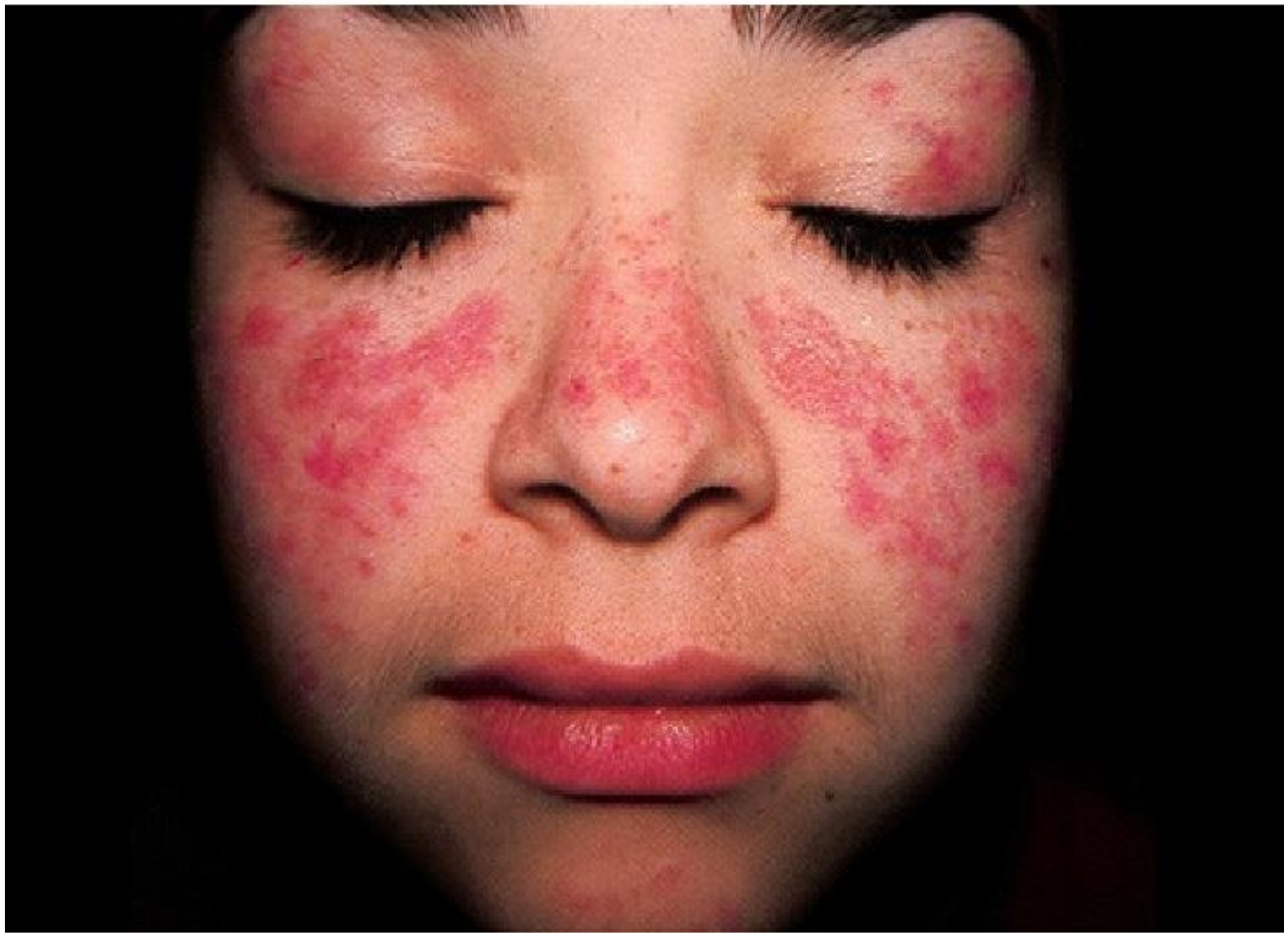
- **Sex and hormones** SLE affects women more than men. Women also may experience more severe symptoms during pregnancy and with their menstrual periods → female hormone estrogen may play a role in causing SLE.

Symptoms of SLE

Symptoms can vary and can change over time. Common symptoms include:

- severe fatigue
- joint pain and swelling
- headaches
- a rash on the cheeks and nose, which is called a “butterfly rash”
- hair loss
- Anemia and blood-clotting problems
- fingers turning white or blue and tingling when cold, which is known as Raynaud’s phenomenon

Other symptoms depend on the part of the body the disease is attacking, such as the digestive tract, the heart, or the skin.



Treatment

- No cure for SLE exists.
- The goal of treatment is to ease symptoms.
- Treatment can vary depending on how severe symptoms are and which parts of the body affects.
- The treatments may include:

- ✓anti-inflammatory medications for joint pain and stiffness
- ✓steroid creams for rashes
- ✓corticosteroids to minimize the immune response
- ✓antimalarial drugs for skin and joint problems
- ✓disease modifying drugs or targeted immune system agents for more severe cases

complications

SLE can damage or cause complications in systems ,possible complications may include:

- blood clots and inflammation of blood vessels or vasculitis
- inflammation of the heart, or pericarditis ,a heart attack
- a stroke
- memory changes ,behavioral changes ,seizures
- inflammation of lung tissue and the lining of the lung, or pleuritis
- kidney inflammation ,decreased kidney function,kidney failure
- serious negative effects during pregnancy. It can lead to miscarriage.

celiac disease

- **Celiac disease**, is a long term autoimmune disorder primarily affecting the small intesten that occurs in people who are genetically predisposed .
- Celiac disease is caused by a reaction to gluten, which are various proteins found in wheat and in other grains , gluten free grains are usually tolerated, an abnormal immune response may lead to the production of several different autoantibodies that can affect a number of different organs.
- In the small-bowel this causes an inflammatory reaction and may produce shortening of the villi lining the small intestine villous atrophy,this affects the absorption of nutrients, frequently leading to anaemia.

- Coeliac disease appears to be multifactorial, both in that more than one genetic factor can cause the disease and in that more than one factor is necessary for the disease to manifest in a person.

- There are various theories as to what determines whether a genetically susceptible individual will go on to develop coeliac disease. Major theories include surgery, pregnancy, infection and emotional stress.

- Diagnosis is typically made by a combination of blood antibody tests and intestinal biopsies.

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- The only known effective treatment is a strict lifelong gluten free diet , which leads to recovery of the intestinal mucosa, improves symptoms, and reduces risk of developing complications in most people.

Rheumatoid arthritis (RA)

- In this disease, autoantibodies are formed against IgG. These auto antibodies are called rheumatoid factors and are of the IgM class.
- RA affects primarily women between the ages of 30 to 50 years, The agent that induces these autoantibodies is unknown.
  - The main clinical finding is inflammation of the small joints of the hands and feet. Other organs, such as pleura, pericardium, and skin, can also be involved.
  - The diagnosis of RA is supported by detecting rheumatoid factors in the serum.
  - Treatment of RA typically involves :
    - aspirin,
    - nonsteroidal anti-inflammatory drugs,
    - immunosuppressive drugs, or corticosteroids.

Rheumatic fever – Group A streptococcal infections regularly precede the development of rheumatic fever. Antibodies against the M protein of group A streptococci that cross-reacts with myosin in cardiac muscle and joint tissues are involved in the pathogenesis of rheumatic fever.

Hemolytic anemias, thrombocytopenias, and granulocytopenias – various forms of these disorders have been attributed to the attachment of autoantibodies to cell surface and subsequent cell destruction.

Pernicious anemia is caused by antibodies to intrinsic factor, a protein secreted by parietal cells of the stomach that facilitates the absorption of vitamin B_{12}.

Idiopathic thrombocytopenic purpura is caused by antibodies directed against platelets. Platelets coated with antibody are either destroyed in the spleen or lysed by the membrane attack complex of complement.

Diabetes in this diseases, antibodies to receptors play a pathogenic role. In extreme insulin resistance in diabetes, antibodies to insulin receptors have been demonstrated that interfere with insulin biding

Glomerulonephritis– In this syndrome, autoantibodies are formed against the collagen in basement membrane of the kidneys and lungs. GS affects primarily young men. The agent that induces these autoantibodies is unknown, but GS often follows a viral infection.