

Autoimmunity is a condition in which the **immune system mistakenly attacks the body's own healthy tissues**, thinking they are foreign invaders like viruses or bacteria. This leads to **chronic inflammation, tissue damage**, and a wide variety of **autoimmune diseases**.

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□ How does autoimmunity develop?

Under normal circumstances, the immune system has mechanisms of **self-tolerance**, meaning it can distinguish between “self” and “non-self.” In autoimmunity, this tolerance is **broken**, and immune cells begin to target the body's own antigens (self-antigens).

Key mechanisms include:

- **Loss of central tolerance** (in thymus or bone marrow) - **Defects in peripheral tolerance** (failure to suppress rogue immune cells) - **Molecular mimicry** (pathogens resemble self-proteins) - **Epitope spreading** (initial immune attack expands to other self-antigens) - **Aberrant activation of nucleic acid sensors**, like **TLRs or cGAS**, leading to inappropriate immune signaling

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□ What happens in autoimmune diseases?

- **Autoantibodies** and **autoreactive T cells** target specific organs or systems - **Chronic inflammation** and **tissue destruction** - Often **cyclical flares** and remissions

Examples of autoimmune diseases: - **Systemic lupus erythematosus (SLE)** – affects skin, kidneys, joints, and brain - **Rheumatoid arthritis** – joints - **Type 1 diabetes** – pancreas (β-cells) - **Multiple sclerosis** – central nervous system (myelin) - **Hashimoto's thyroiditis** – thyroid gland

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□ Biomarkers and Diagnosis

- **Autoantibodies** (e.g., ANA in lupus, anti-TPO in Hashimoto's) - Elevated **cytokines** (like IFN-α, IL-6) - Imaging and **organ-specific tests**

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□ Treatment Approaches

- **Immunosuppressants** (e.g., corticosteroids, methotrexate) - **Biologics** (e.g., TNF inhibitors, anti-IL-6, anti-CD20) - **Targeted therapies** (e.g., JAK inhibitors, cGAS-STING inhibitors in trials) - **Plasmapheresis** (in severe cases)

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□ Take-home message

Autoimmunity is a **malfunction of immune self-recognition**, leading to **inflammatory disease**. While once considered incurable, modern therapies are increasingly **targeted** and **personalized**, offering better control and improved quality of life for patients.

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Last update: **2025/05/13 02:15**

