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OPINION ARTICLE

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A Note on Classification of Antigens

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Description

Antigens are big protein molecules found on the pathogen's surface, such as bacteria, fungi, viruses, and other foreign particles. When these toxins enter the body, they induce an immune response that results in the production of antibodies.

Antigens of various types

A molecule that is part of an object that is foreign to the body is called an antigen. Antibodies recognize the foreign object by its antigens, triggering an immune response that involves white blood cells producing more antibodies and activating other immunological pathways. Proteins or carbohydrates found on the outer surfaces of pathogenic cells can be antigens. Antigens are found in all cells, including those inside the body, bacteria, and viruses. The immune system's antibodies are tailored to the antigen that triggered the immunological response in the first place. Antibodies have an antigen recognition site (paratope) with a high affinity for an antigen region known as the epitope.

Antigens are divided into three categories.

Exogenous, endogenous (made by internal bacteria and virus reproducing inside a host cell), and auto-antigens are the three types of antigens (produced by the host). Auto antigens do not normally elicit an immune response, but a sensitized immune system will launch an attack, leading to the onset of an autoimmune illness. Allergies are a popular term for the presence of auto antigens.

Antigens of blood groups

The antigens found on red blood cells are probably some of the most well-known. The proteins and carbohydrates that coat the surface of red blood cells are known as globulins. The antigens A, B, and O are sugars, also known as glycans. The Rh antigen is a protein that can be present (+) or lacking (-). The effect of defining these antigens together is blood type. Before these antigens were examined and characterised, many people died as a result of mismatched blood transfusions. A strong immunological response against the transfused red blood cells was the cause of those deaths.

Antigens of the influenza virus

Because of its fast rate of mutation, the influenza virus is highly harmful to public health. Hem agglutinin and neuraminidase glycoproteins are antigens found on the surfaces of influenza viruses. Antigenic drift occurs when the hem agglutinin antigen undergoes rapid mutations, allowing the virus to evade detection by antibodies. Small amino acid changes in the glycoprotein can alter the epitope to the point where the antibody no longer recognizes the antigen. This is why a new flu vaccine is released every year. Vaccine developers study influenza mutation patterns all across the world in order to forecast what new strains will emerge during the coming flu season.

Because the antigen-antibody interaction is extremely precise, even minor changes in the antigen protein structure can render a previously matched antibody useless.

Antibodies

A discussion of antigens would be incomplete without a mention of antibodies. Antibodies are immune system molecules that are shaped like a Y. The paratope, the portion that binds the antigen at its epitope, is located in the "arms." The structure and form of the region, as well as the amino acids in this part of the antibody and antigen, determine the strength of the contact. The antigen's crucial amino acids that bind the antibody may not be in a straight line, but rather bind along curves and folds. Affinity, which is measured in molarity, can be used to describe the strength of this interaction. The stronger the affinity or strength of the contact, the smaller the molarity of antibody required to bind the antigen. Antibodies can become more affine to antigens after being exposed to them repeatedly, a process known as affinity maturation. The immune system relies heavily on the interaction between antibodies and antigens.

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