OPEN ACCESS Freely available online

Immunome Research

ISSN: 1745-7580

Opinion Article

Monoclonal Antibodies: A Revolution in Immunology and Medicine

Gabriel Bsteh*

Department of Medical Science, University of Siena, Siena, Italy

ABOUT THE STUDY

Monoclonal antibodies are laboratory-made proteins that mimic the immune system's ability to fight off harmful pathogens, such as viruses or cancer cells. They are designed to recognize and bind to specific antigens (a molecule that induces an immune response) on the surface of cells and destroy them. These antibodies are produced by identical immune cells (clones) that are all derived from a single parent cell.

Development of monoclonal antibodies

The development of monoclonal antibodies has since revolutionized the field of immunology and medicine, offering a new way to diagnose and treat a wide range of diseases. The production of monoclonal antibodies involves several steps, starting with the isolation of B-cells from the spleen of an animal, usually a mouse or a rat, that has been exposed to a specific antigen. These B-cells are then fused with cancer cells to create hybridomas, which can produce large quantities of identical antibodies. The resulting monoclonal antibodies are purified and tested for their specificity and effectiveness in binding to the target antigen.

Types of monoclonal antibodies

There are two main types of monoclonal antibodies: murine (mouse-derived) and chimeric/humanized (engineered to be less immunogenic in humans). Murine monoclonal antibodies are highly effective in binding to their target antigens, but their use in humans is limited due to their high immunogenicity, which can lead to the formation of antibodies against the mouse protein, causing allergic reactions and reduced efficacy over time. To overcome this limitation, researchers have developed chimeric and humanized monoclonal antibodies, which contain both human and mouse or rat protein sequences. These engineered antibodies have been shown to be less immunogenic in humans and can be used for a longer duration.

Applications of monoclonal antibodies

Monoclonal antibodies have a wide range of applications in medicine, including:

Cancer treatment: Monoclonal antibodies can be used to treat cancer by targeting specific antigens on cancer cells, causing the immune system to attack and destroy them. Examples include rituximab for lymphoma and trastuzumab for breast cancer.

Immunotherapy: Monoclonal antibodies can also be used to stimulate the immune system to attack cancer cells or other disease-causing agents. Examples include checkpoint inhibitors, which block certain molecules that prevent immune cells from attacking cancer cells, and CAR-T cell therapy, which involves modifying a patient's own T-cells to recognize and destroy cancer cells.

Diagnosis: Monoclonal antibodies can be used as diagnostic tools to detect the presence of specific antigens in a patient's blood or tissue samples. This can help in the early detection and diagnosis of diseases, such as HIV and hepatitis C.

Treatment of autoimmune diseases: Monoclonal antibodies can also be used to treat autoimmune diseases, such as rheumatoid arthritis and psoriasis, by targeting specific molecules involved in the immune response.

Infectious diseases: Monoclonal antibodies can be used to treat infectious diseases, such as COVID-19, by targeting specific antigens on the surface of the virus and preventing it from entering human cells.

Limitations of monoclonal antibodies

Despite their many advantages, monoclonal antibodies have several limitations:

High cost: Monoclonal antibodies are expensive to produce and can cost thousands of dollars per treatment, making them inaccessible to many patients, particularly in developing countries.

Limited effectiveness: Monoclonal antibodies may not be effective in all patients, as some patients may develop resistance to the treatment or not respond to it at all.

Potential side effects: Monoclonal antibodies can cause side effects, such as allergic reactions, fever, and chills, although these are usually mild and well-tolerated.

Correspondence to: Gabriel Bsteh, Department of Medical Science, University of Siena, Siena, Italy, Email: Gabrielbh@yahoo.com

Received: 06-Feb-2023, Manuscript No. IMR-23-22239; **Editor assigned:** 09-Feb-2023, PreQC No. IMR-23-22239 (PQ); **Reviewed:** 24-Feb-2023, QC No. IMR-23-22239; **Revised:** 03-Mar-2023, Manuscript No. IMR-23-22239 (R); **Published:** 10-Mar-2023, DOI: 10.35248/1745-7580.23.19.229

Citation: Bsteh G (2023) Monoclonal Antibodies: A Revolution in Immunology and Medicine. Immunome Res 19: 229

Short half-life: Monoclonal antibodies have a short half-life, which means that they need to be administered frequently, often *via* intravenous infusion, making them inconvenient for patients.

Future of monoclonal antibodies

Despite their limitations, monoclonal antibodies continue to be an area of active research and development, with new therapies being developed for a wide range of diseases. Advances in technology and manufacturing processes are also expected to drive down the cost of these treatments and make them more accessible to patients. One promising area of research is the development of bispecific antibodies, which can bind to two different targets simultaneously. This approach has the potential to enhance the effectiveness of monoclonal antibodies and broaden their range of applications. Another area of interest is the use of monoclonal antibodies as a tool for drug delivery, by attaching drugs or toxins to the antibody, allowing targeted delivery to specific cells or tissues.

Monoclonal antibodies are a powerful tool in the fight against diseases, offering targeted and specific treatments that can be effective against a wide range of conditions. While they have their limitations, continued research and development are expected to drive down costs and improve their effectiveness, making them an important part of modern medicine.