Commentary

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Monoclonal Antibodies

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Abstract

Monoclonal Antibodies (MABs) are a type of antibody produced by identical B cell clones in response to a specific antigen. Several features of MABs are same, including protein sequence, antigen-binding site area, binding affinity for targets, and downstream functional effects. These properties distinguish MABs from polyclonal antibodies, which have a wide range of activity and recognise several epitopes on an antigen. Murine MABs were the first generation of MABs created via hybridoma technology, however because of their murine origin, they might induce an anti-mouse antibody response in the host, potentially speeding up MAB clearance and causing unwanted allergic reactions if given repeatedly. This problem was remedied by establishing engineering approaches for creating chimeric or humanised antibodies that were less immunologic. Applications of monoclonal antibodies have become an innovative technique of targeting antigens in a range of disorders, including autoimmunity, cancer, and asthma. MABs are very useful biological reagents in immunodiagnostic assays because of their high specificity and affinity binding capabilities. They can be employed in the diagnosis of infectious diseases and the detection of specific antigens, as well as in serological tests to identify antibodies to a certain antigen.

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Introduction

Antibodies, also known as Immunoglobulins (Ig), are glycoproteins produced by plasma cells, which are specialised B lymphocytes that respond to antigens. The gene recombination mechanism in the hyper-variable areas of antibodies is responsible for the variability of antibody responses to different antigens. Antibodies undergo gene rearrangement during the recombination process in their genes, allowing them to bind to a variety of targets [1]. Antibodies are prominent molecules with high efficiency in a variety of therapeutic and diagnostic applications due to their great specificity and diversity.

Monoclonal Antibodies (MABS) are a type of antibody produced by identical B cell clones in response to a specific antigen. Monoclonal antibodies have the same protein sequence, antigen-binding site area, binding affinity for their targets, and downstream functional effects as monoclonal antibodies. These properties distinguish MABS from polyclonal antibodies, which have a wide range of activity and recognise several epitopes on an antigen.

Since the first mAb was licenced in 1986, using mAbs has become an innovative technique of targeting antigens in a wide range of diseases and situations. The first MAB approved by the Food and Drug Administration was Orthoclone OKT3® (muromonab-CD3) (FDA). Kohler and Milston developed OKT3 for the treatment of acute transplant rejection using murine hybridoma technology [2]. MABS are currently being tested in clinical trials for inflammatory and autoimmune diseases (e.g., rheumatoid arthritis, systemic lupus erythematosus, psoriasis, and inflammatory bowel diseases), malignancies (e.g., leukaemia, melanoma, breast cancer, and multiple myeloma), cardiovascular, and infectious diseases [3].

Murine Monoclonal Antibodies (MABS) were the first monoclonal antibodies created using hybridoma technique. They contain no human components and could result in the production of Human Anti-Mouse Antibodies (HAMAs). The HAMA response generated hypersensitivity reactions (e.g., anaphylaxis and serum sickness) in the recipients, causing antibodies to be cleared quickly or their effectiveness to be reduced [4]. To solve these difficulties, genetic engineering techniques and transgenic animals were developed, allowing a changed cell line to produce an altered antibody that was structurally similar to human antibodies. Because their constant region is human and their variable region is murine, these modified antibodies are known as chimeric MABS.

Scientists in Cambridge, United Kingdom, created this technique for the first time in the 1980s. Then, to lessen mAb immunogenicity and side effects, humanised and fully human mAbs were produced. Humanized antibodies have human light and heavy chains, but their hypervariable sections are still murine, whereas fully human antibodies have no hypervariable regions. They are, however, immunogens, and the formation of Antidrug Antibodies (ADAs) may have serious consequences [5].

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