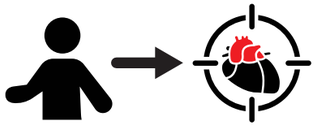
Therapeutic monoclonal antibodies

Overcoming challenges to accelerate drug development

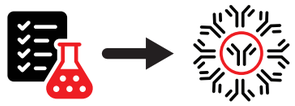
Monoclonal antibodies (mAbs) and antibody-drug conjugates (ADCs) have revolutionized the life sciences, and are crucial components of modern medicine, contributing to highly effective, personalized patient care. In less than 40 years, therapeutic mAbs have transitioned into powerful tools, transforming the lives of patients with previously untreatable diseases, including autoimmune conditions and various cancers. Hundreds of thousands of people have benefitted from these therapeutics since their entry into the market, and new mAbs and ADCs are currently in development, with many already in the final approval stages. Two Nobel Prizes in Physiology or Medicine have been awarded to scientists who made substantial contributions to mAb development, in 1984 and 2018, demonstrating their potential for improving human health.[1,2]

Although a rapidly expanding field, the overall discovery and development of a single novel mAb is slow, with 17 years the average lag time between initial research and market launch of any drug.[3] mAb development especially is still plagued by a number of challenges, both in and out of the lab.



Target Selection And Validation

Identifying a promising target requires extensive and time-consuming research and a deep understanding of underlying disease biology tested in relevant disease models.[10]

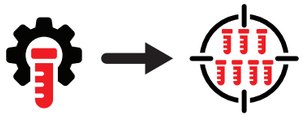


Lead Identification And Optimization

mAb binding affinity, specificity, stability, and pharmacokinetic properties must be optimized through various complex and time-consuming approaches. Candidates must also be characterized in a series of *in vivo* experiments to exclude any immunogenic glycosylation profiles.[11]

Cell Line Development

Identifying and selecting high-producing cell clones from the transfected cell population is a crucial step in mAb development, requiring quick identification of clones that exhibit desirable characteristics, such as high antibody productivity and stability.[10]

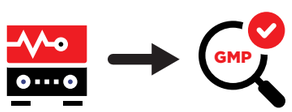


Process Scalability

Cell-based expression systems are costly and inefficient, and challenging to scale up. Analytical tools often have limited throughput, while downstream processes needed to remove biological contaminants can degrade the mAb, leading to product instability and loss and resulting in low yields.[10]

Time From Bench To Bedside

Antibody drug discovery and development is slow. Modern cell line development (e.g. clone selection) and process development (e.g. media development and feed optimization), as well as analytical solutions (e.g. clone characterization), are needed to shorten the time-to-market.



GMP Regulations

WHO guidance on therapeutic mAbs[7] follows GMP regulations by the US FDA,[8] EMA,[9] and other regulatory agencies. Using GMP-enabling instruments from trusted providers throughout the development process can ease the transition to manufacturing.

Fast-tracking mAb development

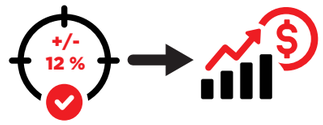
Partnering with trusted solution providers will remain a steadfast approach to combatting these challenges. Automation platforms and precision instruments can streamline mAb and ADC development – from early-stage research to analysis – helping to ensure a steady pipeline of therapeutic mAbs reach patients in need.

Data Reliability In The Lab

Therapeutic mAbs require laboratory techniques and instruments that deliver accurate and reliable results across discovery, development and manufacturing, and must adhere to FDA and EMA guidelines.[5]

Instrument-To-Instrument Variability

Instrument variability directly impacts the reliability and validity of findings, and is a consideration in the ICH's analytical procedure development guidelines.[6] A low instrument-to-instrument variability is needed to generate high quality data across multiple labs.



Success Rate

Only 12% of drugs that enter clinical trials result in an approved medicine, and each approved drug costs an estimated average of USD 2.6 billion in R&D.[4]

Cost Of Instrumentation

Laboratory automation increases speed and improves consistency of results, but high-quality instruments aren't always accessible to some organizations.

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ICH = International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use, **EMA =** European Medicines Agency, GMP = Good Manufacturing Practices, **WHO =** World Health Organization, **FDA =** Food & Drug Administration

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