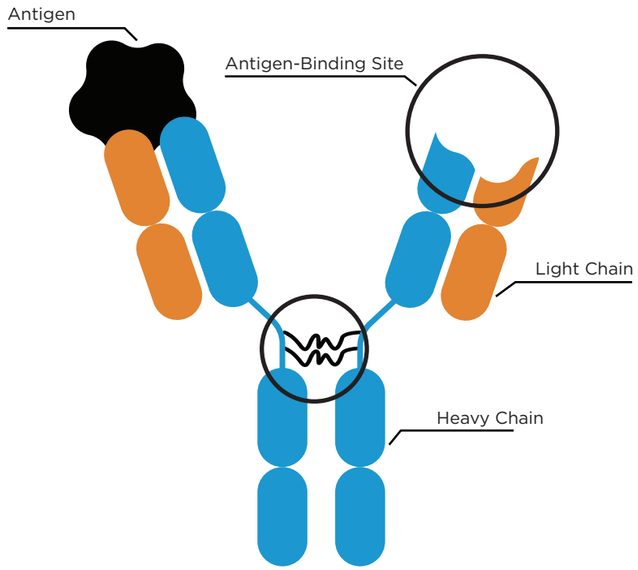
Monoclonal Antibodies: Revolutionizing Medicine



What Are Antibodies?

Monoclonal antibodies (mAbs) have revolutionized the field of therapeutics, providing highly specific and targeted treatments for a wide range of diseases. Beginning with the advent of hybridoma technology, the generation of mAbs with defined antigen specificity became possible. The subsequent advancements in antibody engineering, including the development of phage display libraries, transgenic animals, and in vitro selection techniques, expanded the repertoire of mAbs. These innovations allowed for the generation of antibodies with enhanced binding affinity, altered effector functions, and improved pharmacokinetic properties. This poster presents a chronological journey through key milestones, highlighting the scientific breakthroughs that have propelled the field forward.

Discovery Milestones

1975 — Kohler and Milstein develop hybridoma technology, making it possible to obtain mAbs in large quantities.[1]

1985 — George Smith describes Phage Display Technology as a method of presenting polypeptides on the surface of bacteriophages.[2]

1986 — Muromonab, anti-CD3 antibody, is the first mAb therapy approved for preventing kidney transplant rejection.[3]

1986 — The complementarity-determining region (CDR) grafting technique is explored, accelerating the development of humanized mAbs.[4]

1993 — Discovery of single domain antibodies (nanobodies) in Camelidae.[5]

1994 — Abciximab is the first chimeric manufactured using hybridoma cells (human-murine) to be approved.[6]

1997 — Rituximab is approved to treat some blood cancers, the first mAb therapy for any malignancy.[7]

1997 — The first humanized mAb – daclizumab – is approved.[8]

1998 — Infliximab, targeting TNF-alpha, is the first mAb approved for the treatment of Crohn's disease, and later approved for other autoimmune diseases including rheumatoid arthritis, ankylosing spondylitis, plaque psoriasis and ulcerative colitis.[14]

1998 — Trastuzumab is the first approved targeted therapy for cancer. It targets the HER-2-positive breast cancer.[13]

2000 — Calicheamicin conjugated to anti-CD33 antibody (Gemtuzumab) is the first antibody-drug conjugate approved by the FDA.[9]

2002 — Adalimumab is the first phage display-derived mAb, as well as the first human antibody approved for therapy.[10]

2011 — The first immune checkpoint inhibitor – Ipilimumab – is approved.[11]

2014 — FDA approves the first bi-specific antibody, Blinatumomab, binding to both CD19 on the surface of B cells and CD3 on the surface of T cells.[15]

2014 — Pembrolizumab, anti-PD-1-targeting antibody is approved by the FDA for Advanced Melanoma. The list of cancers extends every year, with the latest approval made in January 2024 for cervical cancer.[12]

2018 — James Allison and Tasuku Honjo receive Nobel Prize for their discovery of cancer therapy by inhibition of negative immune regulation (anti-CTLA4 antibody).

2022 — 162 mAbs have been approved to date by at least one regulatory agency around the world.[16]

Learn more about newest trends in the discovery, development and manufacturing of mAbs. www.beckman.com/monoclonal-antibodies

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