THE MONOCLONAL ANTIBODY REVOLUTION – WHAT INSURERS NEED TO KNOW

Abstract

Monoclonal antibodies (mAbs) were first produced in the laboratory in the mid-1970s. At the time they were hailed as a modern advance in medicine, but their application to clinical medicine came slowly. Recently, however, there has there been a rapid development of new and diverse medical indications for mAbs – nothing short of a therapeutic revolution. According to The Antibody Society, antibody-based therapeutics are advancing in clinical development at a rapid rate and are being approved for use in record numbers. This Brief Report will define mAbs, review their clinical indications, and examine the potential impact of this fast-growing class of therapeutics on insurance medicine. mAbs are also playing an emerging role in the treatment of COVID-19, and this will be addressed.

What are Monoclonal Antibodies?

Monoclonal antibodies (mAbs) are specialized proteins produced by immune system B cells. Their unique structure and function allow them to bind to highly specific targets or receptors. Therapeutic mAbs are designed specifically to prevent or treat particular diseases or clinical conditions. Their mechanisms of action are varied and can include killing of cells, immune modulation, or neutralization of an infectious agent.

mAbs can be produced in large quantities via the hybridoma technique, which was introduced in 1975. In this technique, B cells are "immortalized" by fusing them with myeloma cells which then leads to continuous mAb production and cell growth. Additional methods have now been developed to produce mAbs and, depending on the method, mAbs can be described as human, humanized, chimeric, or murine. Fully humanized mAbs have human biological properties and so can carry out their therapeutic functions with better clinical tolerance and without generating undesirable allergic reactions or side effects.

Clinical Applications and Indications for mAbs

The first therapeutic mAb, muromonab CD3, was approved by the U.S. Food and Drug Administration (FDA) in 1986 to prevent acute organ transplant rejection. Since then, mAb engineering has evolved significantly, leading to the growth of this major class of drugs. As of December 21, 2020, nearly 100 therapeutic mAbs have been approved by the U.S. FDA and by 2025, the global market is projected to be valued at US$300 billion.

The list of clinical indications for mAbs is also growing rapidly, both preventatively and therapeutically. These include several hematologic and solid cancers, autoimmune disorders such as rheumatoid arthritis, certain types of asthma, multiple sclerosis, bone loss, macular degeneration, and psoriasis, to name a few. mAbs can also

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be designed to deliver a toxin or drug to a particular site such as a cancer cell. Figure 1, below, provides a more comprehensive list of therapeutic indications and applications of mAbs.

Figure 1: High-Level Clinical Indications and Uses of Monoclonal Antibodies
Asthma
Autoimmune disorders
Blood disorders
Drug reversal
Hematologic malignancies
Hypercholesterolemia
Infectious diseases
Macular degeneration
Migraine
Muckle-Wells syndrome
Multiple sclerosis
Organ transplant rejection
Osteoporosis
Prevention of blood clotting
Solid tumors
X-linked hypophosphatemia

Monoclonal Antibodies and COVID-19

Any discussion regarding mAbs would be incomplete without mentioning their emerging and significant role in the fight against COVID-19. The majority of mAb compounds under development for SARS-CoV-2 target the virus' well-described spike protein. Inpatient and outpatient trials are ongoing.

On November 9, 2020, the U.S. FDA granted an Emergency Use Authorization (EUA) for bamlanivimab for outpatient use. Bamlanivimab is authorized for patients with positive results of direct SARS-CoV-2 viral testing who are 12 years of age and older, weigh at least 40 kilograms (about 88 pounds), and are at high risk for progressing to severe COVID-19 and/or hospitalization. This includes individuals 65 years of age or older or those who have certain chronic medical conditions, such as cardiovascular disease or COPD. Additionally, on November 21, 2020, the U.S. FDA issued an EUA for the combination casirivimab and imdevimab for the treatment of mild to moderate COVID-19 and applies to similar patients outlined in the bamlanivimab EUA. The hope is that more therapeutic mAbs may be approved for the treatment of COVID-19 in the coming weeks and months, as at least nine are currently undergoing human testing.

How Are mAbs Impacting Insurance Medicine?

While there has clearly been expansion and growth of new and innovative mAb therapies in clinical medicine, the translation into long-term improvements in mortality and morbidity remains the focus of insurance medicine. Some benefits may only be measured in months, but others may result in positive effects of much longer duration. Insurers, especially those covering medical reimbursement, will need to monitor the costs associated with mAb therapies. One recent review concluded the average annual cost of mAb therapy was US$96,731 and those used for oncology or hematology indications were US$100,000 higher.

Conclusion

The addition of mAbs to therapeutic regimens is definitely a major medical advance and will hopefully lead to significant improvements in long-term morbidity and mortality outcomes. Expect to see further advancements in this field of research as well as a growing spectrum of diseases for which it may be applicable – both preventatively and therapeutically. The general population as well as insurers will benefit from these developments, but as in all new technologies, costs and benefits should be reviewed carefully. R&F

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