Exploring the side effects and safety concerns of monoclonal antibody treatments.

Filipo Milanese*

Clinica di Malattie Respiratorie e Allergologia, University of Genoa, Italy

Introduction

Monoclonal antibodies (mAbs) have transformed the treatment landscape for various diseases, including cancers, autoimmune disorders, and infectious diseases like COVID-19. These lab-engineered proteins are designed to target specific antigens, offering highly precise therapeutic effects. Despite their effectiveness, mAb treatments are not without risk. Understanding the potential side effects and safety concerns is crucial for clinicians and patients to make informed decisions and to ensure patient safety [1].

One of the most commonly reported adverse effects of mAbs is infusion-related reactions, which typically occur during or shortly after administration. Symptoms may include fever, chills, nausea, rash, headache, or difficulty breathing. These are most frequently observed with chimeric antibodies such as rituximab (Roche), used in treating lymphomas and autoimmune diseases [2].

Hypersensitivity reactions range from mild allergic responses to life-threatening anaphylaxis. These reactions are often caused by the body recognizing the antibody as foreign, particularly in non-humanized mAbs. Premedication with antihistamines and corticosteroids is commonly used to reduce these risks [3].

CRS is a potentially severe reaction characterized by fever, fatigue, hypotension, and multi-organ dysfunction. It occurs due to a rapid release of cytokines into the bloodstream following T-cell activation by mAbs, especially in immunotherapies like CAR-T cells and CD3-targeting antibodies [4].

Some monoclonal antibodies can suppress immune function, leading to increased susceptibility to infections. For example: Rituximab depletes B-cells, increasing the risk of bacterial, viral (e.g., hepatitis B reactivation), and fungal infections. Natalizumab, used for multiple sclerosis, has been linked to progressive multifocal leukoencephalopathy (PML), a rare and often fatal brain infection caused by the JC virus [5].

Patients undergoing mAb therapy often require screening and monitoring for infections before and during treatment. Monoclonal antibodies may sometimes trigger autoimmune phenomena. For instance: Checkpoint inhibitors like nivolumab and pembrolizumab, used in cancer immunotherapy, can lead to immune-related adverse events (irAEs), affecting organs such as the lungs (pneumonitis), liver (hepatitis), and endocrine glands (thyroiditis) [6].

These effects are believed to arise from immune activation against normal tissues, representing a double-edged sword in immunotherapy. Some mAbs have been associated with cardiotoxicity, particularly when used in combination with other drugs: mTrastuzumab, a HER2-targeted mAb used in breast cancer, can impair cardiac function and lead to congestive heart failure, especially when used with anthracyclines [7].

Bevacizumab, an anti-VEGF mAb, can cause hypertension, thromboembolic events, and gastrointestinal perforations. Proper cardiovascular assessment and monitoring are recommended for patients receiving these therapies. Long-term safety data for many mAbs are still evolving. While most adverse effects occur early, some risks may develop over months or years of therapy, such as: Secondary malignancies, particularly with prolonged immunosuppression [8].

Delayed hypersensitivity reactions, manifesting as skin eruptions or serum sickness-like symptoms weeks after treatment. Given the increasing use of mAbs in chronic conditions, ongoing pharmacovigilance is essential.The safety profile of monoclonal antibody treatments can vary significantly depending on patient-specific factors: Older patients are more susceptible to adverse events due to comorbidities. Individuals with cardiac or hepatic impairments are at higher risk of organ-specific toxicity [9].

Certain HLA types may influence susceptibility to adverse reactions. Personalized treatment strategies and risk assessments are critical for optimizing safety. These reduce infusion-related and hypersensitivity reactions. Blood counts, liver function, and immune markers should be routinely assessed. Immunizations and antiviral or antibacterial prophylaxis may be required before treatment, particularly in immunocompromised patients [10].

Conclusion

Monoclonal antibodies are powerful therapeutic agents that have revolutionized disease management across multiple domains. However, they are associated with a range of side effects, from mild allergic reactions to severe, life-threatening complications. By understanding these risks, conducting thorough patient assessments, and implementing proactive safety measures, healthcare providers can enhance the safe and effective use of monoclonal antibody therapies. Ongoing research, surveillance, and patient education remain critical to improving long-term safety profiles.

***Correspondence to:** Filipo Milanese, Clinica di Malattie Respiratorie e Allergologia, University of Genoa, Italy. E-mail: filipo.milanese@unige.it

***Received:** 03-Apr-2025, Manuscript No. AAJCIT-25-163919; **Editor assigned:** 04-Apr-2025, Pre QC No. AAJCIT-25-163919(PQ); **Reviewed:** 17-Apr-2025, QC No AAJCIT-25-163919; **Revised:** 21-Apr-2025, Manuscript No. AAJCIT-25-163919(R); **Published:** 28-Apr-2025, DOI:10.35841/aajcit-8.2.263*

***Citation:** Milanese F. Exploring the side effects and safety concerns of monoclonal antibody treatments. J Cancer Immunol Ther. 2025;8(2):263*

References

1. Kane MA. Preventing cancer with vaccines: progress in the global control of cancer. Cancer Prev Res. 2012;5(1):24-9.
2. Massarweh A, Eliakim-Raz N, Stemmer A, et al., Evaluation of seropositivity following BNT162b2 messenger RNA vaccination for SARS-CoV-2 in patients undergoing treatment for cancer. JAMA Oncol. 2021;7(8):1133-40.
3. Stanford MM, McFadden G. Myxoma virus and oncolytic virotherapy: a new biologic weapon in the war against cancer. Expert Opin Biol Ther. 2007;7(9):1415-25.
4. Wen R, Umeano AC, Kou Y, et al., Nanoparticle systems for cancer vaccine. Nanomed. 2019;14(5):627-48.
5. Mannino MH, Zhu Z, Xiao H, et al., The paradoxical role of IL-10 in immunity and cancer. Cancer Lett. 2015;367(2):103-7.
6. Goshen-Lago T, Waldhorn I, Holland R, et al., Serologic status and toxic effects of the SARS-CoV-2 BNT162b2 vaccine in patients undergoing treatment for cancer. JAMA Oncol. 2021;7(10):1507-13.
7. Zhou J, Yu G, Huang F. Supramolecular chemotherapy based on host–guest molecular recognition: a novel strategy in the battle against cancer with a bright future. Chem Soc Rev. 2017;46(22):7021-53.
8. Stone EG, Morton SC, Hulscher ME, et al., Interventions that increase use of adult immunization and cancer screening services: a meta-analysis. Ann Intern Med. 2002;136(9):641-51.
9. Klebanoff CA, Gattinoni L, Restifo NP. CD8+ T-cell memory in tumor immunology and immunotherapy. Immunol Rev. 2006;211(1):214-24.
10. Overwijk WW, Lee DS, Surman DR, et al., Vaccination with a recombinant vaccinia virus encoding a "self" antigen induces autoimmune vitiligo and tumor cell destruction in mice: requirement for CD4+ T lymphocytes. Proc Natl Acad Sci. 1999;96(6):2982-7.

Citation: *Milanese F. Exploring the side effects and safety concerns of monoclonal antibody treatments. J Cancer Immunol Ther. 2025;8(2):263*