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Radioimmunotherapy as a New Treatment for HIV, Bacterial and Fungal Infections

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Abstract

On the other hand, efforts have been made to use radiolabeled antimicrobial peptides, chemotactic cytokines, leukotriene b4 antagonists, bacteriophages, chitinase and fluconazole to differentiate sterile inflammation from infection and notoriously difficult-to-diagnose fungal infections from bacterial infections. Fanolesomab (NeutroSpec), a murine IgM monoclonal antibody to CD15 that co-localizes with human polymorphonuclear neutrophils (PMNs) at the sites of infection, was also evaluated for use in imaging of infection and inflammation in healthy volunteers and patients. Here we will introduce the synopsis of the helpful viability of RIT of contaminations, its harmfulness and radiobiological instruments as well as will frame future point of view for consolidating RIT of diseases with present day imaging procedures like SPECT and PET.

Keywords: Bispecific antibody • Cancer • Monoclonal antibody

Introduction

Radioimmunotherapy (RIT) is a form of cancer treatment that combines the specificity of monoclonal antibodies (mAbs) with the cytotoxicity of ionizing radiation. This therapeutic approach has been developed over the last few decades and has shown great potential in treating cancer, particularly hematologic malignancies such as lymphomas and leukemias. RIT offers several advantages over traditional cancer treatments, such as chemotherapy and external beam radiation therapy, including increased specificity and reduced toxicity to normal tissues. In this article, we will discuss the mechanism of action, clinical applications and limitations of RIT. The underlying mechanism of RIT involves the use of a radioactive isotope that is attached to a monoclonal antibody. Monoclonal antibodies are proteins that can be designed to recognize and bind to specific antigens on cancer cells. The radioactive isotope, which emits high-energy particles, is delivered directly to the cancer cells via the monoclonal antibody. Once the isotope is inside the cancer cell, it emits ionizing radiation, which damages the DNA of the cancer cell and leads to cell death [1].

Radioimmunotherapy, also known as targeting radionuclides with antibodies, has been a busy area of study for nearly 50 years. It has changed as molecular biology and chemistry technology has improved. Numerous significant preclinical and clinical studies have shown the advantages and drawbacks of all targeted therapies. For the treatment of non-Hodgkin lymphoma, two radiolabeled antibodies have been approved; however, radioimmunotherapy of solid tumors remains challenging. Pretargeting, novel antibody constructs and a focus on the treatment of minimal and localized disease are all promising new approaches that are currently being investigated [2].

Literature Review

This situation has rekindled interest in the treatment of infectious diseases with monoclonal antibodies (mAbs). Radioimmunotherapy (RIT), a cancer treatment method, has been successfully used to treat experimental fungal, bacterial and viral infections for the past five years. The feasibility of therapeutically targeting microbes with labeled antibodies is encouraged by the success of this strategy in laboratory studies and previous nuclear medicine experience with pre-clinical and clinical studies demonstrating the utility of radiolabeled organism-specific antibodies for imaging infections. In point of fact, the fact that a specific antibody is able to localize to a site of infection shows that it is possible to use the interaction between the antibody and the antigen to deliver microbicidal radiation to infection sites. This, in turn, strongly supports the idea that this method could be used as a broad antimicrobial strategy. Using highly specific microbe-targeted mAbs to deliver microbicidal radiation has not been attempted until very recently, which is surprising [3].

Discussion

There are two main types of radioactive isotopes used in RIT: beta-emitters and alpha-emitters. Beta-emitters, such as iodine-131 and yttrium-90, emit beta particles that can travel several millimeters in tissue and are useful for treating larger tumors. Alpha-emitters, such as actinium-225 and radium-223, emit alpha particles that have a higher energy and a shorter range, making them more effective in treating smaller tumors or cancer cells that are spread throughout the body.RIT has shown great promise in treating a variety of cancers, particularly hematologic malignancies. The first RIT drug, Zevalin (ibritumomab tiuxetan), was approved by the US Food and Drug Administration (FDA) in 2002 for the treatment of relapsed or refractory low-grade or follicular B-cell non-Hodgkin's lymphoma (NHL). Zevalin is a monoclonal antibody that targets the CD20 antigen on the surface of B-cell lymphoma cells and is labeled with the beta-emitter yttrium [4].

Another RIT drug, Bexxar (tositumomab and iodine I-131 tositumomab), was approved by the FDA in 2003 for the treatment of relapsed or refractory low-grade or follicular B-cell NHL. Bexxar is a monoclonal antibody that targets the CD20 antigen on the surface of B-cell lymphoma cells and is labeled with the beta-emitter iodine-131. In addition to NHL, RIT has also been investigated for the treatment of other hematologic malignancies, such as chronic lymphocytic leukemia (CLL) and multiple myeloma. For example, the monoclonal antibody HuLuc63 targets the CD37 antigen on the surface of CLL cells and is labeled with the beta-emitter lutetium-177. This RIT drug has shown promising results in early-phase clinical trials for the treatment of relapsed or refractory CLL [5].

Conclusion

RIT has also been investigated for the treatment of solid tumors, although

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progress in this area has been slower. One of the challenges of RIT for solid tumors is the limited penetration of the radioactive isotope into the tumor tissue. However, researchers are exploring ways to overcome this limitation, such as using alpha-emitters or combining RIT with other treatments such as chemotherapy or immunotherapy. Although RIT has shown great potential in treating cancer, there are several limitations to its use.

Acknowledgement

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Conflict of Interest

None.

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