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Personalised medicine in oncology:A review of drug formulations.

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ABSTRACT :

Personalized medicine is changing the way we treat cancer. Instead of giving the same treatment to everyone, doctors are now focusing on what works best for each individual patient. This includes using special tests to understand the patient's genes, how their body reacts to drugs, and the type of cancer they have. This article explores how cancer drugs are being designed to match individual needs, including the role of genes, special drug delivery methods, and new types of clinical trials. We also look at the challenges and the future of this exciting approach to cancer care.

Keywords: personalized medicine, cancer treatment, drug design, targeted therapy, pharmacogenomics, nanotechnology, biomarkers, clinical trials

Introduction

Cancer is not the same for everyone. Two people with the same type of cancer can respond very differently to the same treatment. In the past, doctors mostly used standard treatments like chemotherapy for everyone. But now, with more knowledge
about genes and how cancer works, treatments can be more personalized. This is helping doctors choose better drugs and reduce side effects. In this review, we'll see how cancer drug formulations are becoming more focused on the needs of each individual patient.

Why Biomarkers Matter in Cancer Treatment

Biomarkers are special signs in the body, often related to genes, that tell doctors more about a person's cancer. If a patient has a certain gene mutation—like HER2 in breast cancer or EGFR in lung cancer—there are drugs made just for that. For example, trastuzumab is used for patients who have too much HER2 protein in their cancer cells. These drugs are made to target the cancer more accurately and reduce harm to healthy cells.

How Genes Affect Drug Response

Everyone's body is different, and our genes play a big role in how we react to medicine. Some people may break down a drug too fast, while others might be more sensitive to it. That's why doctors are starting to test genes before choosing a cancer treatment. For example, if someone has a change in the TPMT gene, their dose of certain leukemia drugs may need to be lowered to avoid strong side effects.

Drugs That Target Specific Cancer Cells

Many new cancer drugs are made to target only the cancer cells and leave the rest of the body alone. These are called targeted therapies. Some are antibodies that attach to
cancer cells, while others block certain signals inside the cells. These drugs are designed carefully so they reach the right part of the body and don't get broken down too quickly. Some are put inside special carriers, like tiny fat bubbles (liposomes), so they travel safely to the tumor.

Using Nanotechnology in Cancer Drugs

Nanotechnology means working with things that are super small—thousands of times smaller than a cell. In cancer treatment, it allows doctors to send drugs straight to the tumor. These drugs can be packed into tiny particles that look for cancer cells and deliver the medicine there. This helps avoid damage to healthy tissues. Abraxane and Doxil are examples of such drugs that use this method and are already helping patients.

New Types of Clinical Trials

To make sure these personalized drugs are safe and effective, new kinds of clinical trials are being used. Instead of choosing patients based on where their cancer started, researchers now group them by the type of gene mutation they have. Trials like NCI- MATCH and I-SPY are helping match patients with the right drugs faster and more efficiently.

Challenges We Still Face

Even though personalized cancer treatment is promising, there are still some difficulties. These treatments can be expensive, and not all hospitals have access to genetic testing. Also, making new drugs for small groups of patients can be complex and time-consuming. Regulations are also stricter because these treatments often need tests that match patients with the right drug.

What's Coming Next

The future of personalized medicine in cancer looks bright. New tools like artificial intelligence (AI) and better genetic testing will make it easier to find the best treatment for each person. Scientists are also working on personalized vaccines and using gene editing to fix the root cause of cancer. These steps could make cancer care even more precise in the coming years.

Conclusion

Personalized medicine is helping doctors give the right treatment to the right patient at the right time. By using information about a person's genes and the makeup of their cancer, we can create better, safer, and more effective drug treatments. While we still have challenges to overcome, this approach is clearly shaping the future of cancer care.

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