

## Importance of Anticancer Drugs and its Impact on Human Health

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### DESCRIPTION

Cancer remains one of the most complicated challenges in modern medicine, affecting millions worldwide. The constant achieving of effective anticancer drugs has been a central point for pharmaceutical companies alike. Advancements in this field have seen a remarkable evolution, transitioning from traditional chemotherapy to targeted therapies and immunotherapies. These developments offer hope in the fight against cancer, aiming for better outcomes, reduced side effects, and improved quality of life for patients. Traditional chemotherapy, a fundamental in cancer treatment, involves using cytotoxic drugs that aim to kill rapidly dividing cancer cells. These drugs, while effective, often result in severe side effects due to their impact on healthy cells. Nausea, hair loss, and compromised immunity are common adverse effects associated with traditional chemotherapy. The emergence of targeted therapies marked a paradigm shift in cancer treatment. Unlike chemotherapy, targeted therapies focus on specific molecular alterations that drive cancer growth. By targeting these specific pathways, these drugs can be more effective with fewer side effects compared to traditional chemotherapy. Examples include drugs targeting specific genetic mutations like Epidermal Growth Factor Receptor (EGFR) inhibitors for lung cancer or Human Epidermal Growth Factor Receptor (HER2) targeted therapies for breast cancer. Immunotherapy represents a ground breaking approach using the body's immune system to fight cancer. Checkpoint inhibitors, a type of immunotherapy, work by releasing the brakes on the immune system, allowing it to recognize and attack cancer cells. Cell therapy is another innovative form of immunotherapy where a patient's immune cells are engineered to target and destroy cancer cells. The surroundings of anticancer drug development continues to evolve, embracing cutting-edge technologies and novel concepts.

Tailoring treatment based on an individual's genetic makeup and the specific characteristics of their cancer is gaining traction. Personalized therapies offer the potential for better outcomes by customizing treatment plans are exploring combinations of different drugs or treatment modalities to enhance efficacy and overcome drug resistance. This approach aims to disrupt multiple pathways crucial for cancer growth simultaneously. Utilizing nanoparticles for drug delivery shows promise in improving drug efficacy and reducing side effects by targeting cancer cells more precisely. These non-invasive tests analyse circulating tumor cells or tumor Deoxyribonucleic Acid (DNA) fragments in the blood, providing insights into cancer progression and treatment response. They aid in monitoring disease status and detecting genetic changes that may influence treatment decisions. Artificial Intelligence (AI) and machine learning algorithms are being employed to analyse vast datasets and predict drug-target interactions, accelerating drug discovery and development. While advancements in anticancer drug development offer immense promise, challenges persist. Drug resistance, treatment-related toxicities, and access to innovative therapies remain hurdles. Additionally, the high cost of some therapies poses a barrier to widespread accessibility. The future of anticancer drug development looks promising with ongoing research in immunotherapy, targeted therapies, and innovative treatment modalities. Collaborations between academia, pharmaceutical companies, and regulatory bodies are crucial in translating scientific discoveries into effective therapies. The evolution of anticancer drug development signifies a remarkable journey from conventional treatments to targeted therapies and immunotherapies. These advancements hold the promise of improved outcomes and quality of life for cancer patients. With continued research, innovation, and a collaborative approach, the horizon for anticancer therapies appears hopeful, bringing rays of optimism to those affected by this formidable disease.

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**Received:** 01-Dec-2023, Manuscript No. JAP-23-28561; **Editor assigned:** 04-Dec-2023, PreQC No. JAP-23-28561 (PQ); **Reviewed:** 18-Dec-2023, QC No. JAP-23-28561; **Revised:** 25-Dec-2023, Manuscript No. JAP-23-28561 (R); **Published:** 01-Jan-2024, DOI: 10.35248/1920-4159.23.15.396

**Citation:** Manuel A (2023) Importance of Anticancer Drugs and its Impact on Human Health. J Appl Pharm. 15:396.

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