EDITORIAL

Challenges in the Discovery of Novel Therapeutic Agents in Cancer

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Abstract: One of the major challenges currently facing cancer therapy is the development of drug resistance either intrinsically or as a result of treatment. Treatment evasion is mediated by an intricate web of signalling cascades and adaptations caused by selective therapeutic pressure, leading to metastatic spread and patient death. Hence, discovering and designing novel therapeutic compounds and regimens based on specific alterations in the cancer microenvironment and capable of overcoming resistance to traditional therapies is necessary to improve cancer survival outcomes. These new therapeutic modalities should exhibit improved solubility, penetration capacity and bioavailability in the tumor microenvironment as well as enhanced target specificity compared to old generation compounds. The success of this endeavour will contribute to the advent of precision medicine leading to personalized therapeutic approaches for patients.

Keywords: Cancer, drug resistance, therapy, genetic manipulations, stem cells, immune system, drug analogues.

1. INTRODUCTION

According to a statistics report generated by the American Cancer Society, 15.5 million people in the United States have a medical history of cancer [1]. As cancer becomes more prevalent, conventional techniques that are used for diagnosis and therapy, such as radiation and chemotherapy, will not be sufficient to successfully predict and treat cancers [2, 3]. These techniques are not only associated with poor prognoses but also adverse side effects. Additionally, another obstacle is the resistance developed by tumor cells due to the repeated use of chemodrugs [2]. The weaknesses of these conventional techniques call for better and more reliable strategies to fight cancer. For instance, using phytochemicals in chemoprevention or in combinational therapies to avoid cytotoxicity in healthy cells and to sensitize tumor cells to the drugs [4].

Even though, phytochemicals appear promising, their he delivery and bioavailability is, however, another impediment; therefore, the use of theranostic applications is necessary for successful drug development [5, 6]. One such application includes the use of nanoparticles, which not only support cancer therapy but are also advantageous in the diagnosis of tumors [7, 8]. These current advanced therapeutic strategies have now been widely developed in order to improve the prognosis of the patient’s health and also support contemporary, personalised medicine for the patient in accordance with the patient’s stage of cancer, but it is vital to take this development to the next level.

This current volume focuses on the advantages and disadvantages of various therapeutic strategies for cancer. For example, the immuno-therapy is designed to reactivate the body’s immune system to fight against cancer. One type of immunotherapy strategy includes the introduction of mAbs along with the tyrosine kinase inhibitors to allow for the aberrant activity of various proteins like EGFR. The anti-EGFR therapy, even though clinically beneficial, bears its own set of therapeutic challenges due to its adverse reactions. This volume includes a comprehensive literature review on various anti-EGFR agents used for the therapy of PC and their related adverse effects. Additionally, the volume aims to show how combinational therapy, which includes chemotherapy with anti-EGFR, would be a potentiating therapeutic strategy to reach better clinical results. Furthermore, with the information currently available, future research studies for determining novel therapeutic agents for PC treatment will readily demonstrate the efficiency of such agents.

Another promising form of therapy is the use of phytochemicals for chemoprevention. Phytochemicals are also beneficial for the patient’s care because this treatment avoids toxicity within healthy cells. Phytochemicals have a natural bioactive compound extracted from plants, which helps to prevent chronic diseases like cancer. This volume thoroughly discusses the anticancer activity of various phytochemicals. For instance, one article discusses the typhonium secondary metabolite that is used as an alternative medicine for cancer therapy in Southeast Asian countries. A clear elucidation about the chemical structure and characterization of the isolated compounds like cinnamic acid, glycerol and dimethoxy curcumin and combined it with cyclodextrin to overcome the hydrophobic limitations of curcumin (i.e. lower bioavailability and weak solubility). The curcumin-C3 cyclodextrin displayed an antioxidant nature and was efficient enough to regulate oxidative stress developed by the cancer and also inhibit staphylococcus aureus growth. Thus, this finding could be a therapeutic strategy for the treatment of oxidative stress as well as pneumonia. Moreover, the α- and β-Cyclodextrin acted as perfect carriers for the curcumin-C3. Furthermore, the use of curcumin is widely recommended as a dietary phytochemical in order to prevent the risk of CRC, which is one of the most serious and malignant diseases and one of the most common causes for cancer related deaths. The authors have summarized the biological properties of curcumin along with its efficiency on various signalling and genetic pathways to control initiation, progression, and angiogenesis and promote apoptosis in CRC. Thus, this review article reflects novel thoughts and supports the drug discovery methodologies for therapy of CRC in humans.

The C-phycocyanin is also a naturally occurring pigment obtained from the algal and cyanobacterial species. Earlier studies revealed that C-phycocyanin had numerous applications as an anti-inflammatory, antitumor and antioxidant pigment. The current article summarizes its therapeutic applications against various diseases like inflammation and cancer. The article also includes the molecular mechanisms involved in blocking the initiation and cell cycle progression and promoting autophagy and apoptosis of tumor cells. Thus, this could support the future
perspective to benefit health on a global scale via the therapeutic usage of C-phycocyanin. Modern research techniques are now reaching its peaks with the development of theranostics. Theranostics is the discipline that includes nanoscience to unite both diagnosis and therapy and enable the monitoring of diagnosis, delivery of drug and therapeutic response. Moreover, since it is a contemporary and personalised form of medicine, it is more highly evolved compared to conventional therapy.

The article from this journal also focuses on the use of SPIONs as a nanoparticle and thereby a theranostic agent for diagnosis and drug delivery. The article includes 29 publications from NCBI PubMed taken from in vivo and clinical studies of various cancers including breast, cervical and ovarian cancer. This article also provides elaborated therapeutic applications that demonstrate the safe release of drugs with the use of SPION. The use of natural nanomaterials has potentiated the advances in the field of nanoscience. Additionally, this journal includes an article about the design and development of flucooidan formulation used in nanocarriers for cancer therapy. Flucooidan is a naturally available oceanic material from brown seaweeds and has a wide range of health benefits. Along with the design and development of flucooidan formulations, the studies have also summarized the basic principle in incorporating nanomaterials to formulate the development of flucooidan. Thus, the use of flucooidan for anticancer therapy would be considered a revolutionary ideology. The novel therapeutic strategies summarized here have the potential to efficiently potentiate the drug delivery system and improve cancer therapy.

It is our immense pleasure to present this comprehensive summary of therapeutic strategies for cancer to the research community for a better and holistic understanding. We hope that this volume reflects novel research ideas for better therapeutic strategies for the benefit of the patient.

REFERENCES


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