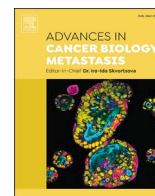




Contents lists available at ScienceDirect

Advances in Cancer Biology - Metastasis

journal homepage: www.journals.elsevier.com/advances-in-cancer-biology-metastasis

Nanovesicles based drug targeting to control tumor growth and metastasis

Azim Ansari^a, Afzal Hussain^{b,*}, Raju Wadekar^a, Mohammad A. Altamimi^b, Abdul Malik^b, Md Ali Mujtaba^c, Mohammad Yousuf Ansari^d, Mohd Usman Mohd Siddique^a, Sameer N. Goyal^e^a Department of Pharmaceutical Chemistry, Shri Vile Parle Kelavani Mandal's Institute of Pharmacy, Dhule, 424001, Maharashtra, India^b Department of Pharmaceutics, College of Pharmacy, King Saud University, Riyadh, 11451, Saudi Arabia^c Department of Pharmaceutics, Faculty of Pharmacy, Northern Border University, Rafha, 91911, Saudi Arabia^d MM College of Pharmacy, Maharishi Markandeshwar deemed to be University, Mullana, Ambala, 133207, India^e Department of Pharmacology, Shri Vile Parle Kelavani Mandal's Institute of Pharmacy, Dhule, 424001, Maharashtra, India

ARTICLE INFO

Keywords:

Cancers
Nanovesicles
Mechanistic perspectives of absorption
Exosomes and neutrophils
Combination therapy

ABSTRACT

Cancer is still a global challenge for healthcare professional and scientists due to complicated pathological pathways, inefficient early diagnosis, and limited safe delivery system at economic treatment cost. Despite these, other factors (life style, environmental problem, socio-economic issues, patient related complications, expensive therapy, and genetic history of oncogene) played significant role to spread and complicate treatment. However, various novel carriers have been explored and reported for effective and efficient drug delivery using polymers and lipid. Among them, vesicular systems are considered as the most biocompatible and safe for delivery of hydrophilic and lipophilic drug candidates. Therefore, the present review addressed various forms of nanovesicular systems with their benefits, progressive development stages, and mechanistic insights for drug targeting (active and passive), specific cancer wise nanovesicles, exosomes, and commercial products with potential clinical applications. The review primarily highlighted the major findings of nanovesicles employed to control solid tumor when a chemotherapeutic drug was used in specific vesicles based nanocarriers. Notably, miscellaneous exosomes, blood cells-based drug delivery (neutrophils and leukocytes), pH-responsive nanovesicles improved drug therapy by targeting tumor tissues and high drug access in the site of action. Finally, co-administration of chemotherapeutic drugs (combination therapy) further revealed convincing therapeutic outcomes as compared to standalone.

1. Introduction

Cancer is a prime reason for death globally and WHO (World Health Organization) reported about 10 million death in 2020. Moreover, 0.4 million cancer cases developed in children annually. In 23 countries, the cervical cancer has been reported to be the most common leading cause of death [1]. Breast cancer is the most common and invasive type of cancer in the course of women life accounting about 12.5% of all cancer cases globally. In January 2022, it was more than 3.8 million women with a history of breast cancer in women in the USA whereas it is expected to reach 30% of all cancer cases in 2022 (43,250 women expected to die in 2022). Notably, about 85% of breast cancer occurs in women with no history of breast cancer [2]. The disease is global challenge due to lack of tangible treatment option, inability to diagnose at early stage of cancer progression, unknown causative factors and effective drugs. Different types and stage of identification have the different survival

rate.

Many cancer therapies are available nowadays from conventional medication to advance therapeutic strategies including novel targets, newer medicines and novel drug delivery of anticancer molecules with enhanced potency and reduced toxicity. However, the common unavoidable topic related with all anticancer therapy is severe toxic effect to normal cells due to non-targeted distribution of drugs causing cardiotoxicity, nephrotoxicity, myelosuppression, and bone marrow depression. Despite of advancement in the site-specific treatments for cancer over-expression targets, the rate of survival is significantly declined. On the other hand, the development of novel Nano-drug delivery system that signifies an important unmet medical need. The tumor target-specific medicines may enhance the drug delivery at larger dose and may increase the therapeutic efficacy with less toxic effect [1]. The traditional drug delivery systems encompasses a smaller number of therapeutic medicines at the illness site [2]. The aim of the target drug

* Corresponding author.

E-mail addresses: amohammed2@ksu.edu.sa, afzal.pharma@gmail.com (A. Hussain).<https://doi.org/10.1016/j.adcanc.2022.100083>

Received 10 August 2022; Received in revised form 13 December 2022; Accepted 14 December 2022

Available online 28 December 2022

2667-3940/© 2022 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Advances in Cancer Biology - Metastasis

2667-3940 (ONLINE)

Website ISSN Portal

About Articles

PUBLISHING WITH THIS JOURNAL

The journal charges up to:
2800 USD
as [publication fees](#) (article processing charges or APCs).
There is a [waiver policy](#) for these charges.

Look up the journal's:
• [Aims & scope](#)

BEST PRACTICE

This journal began publishing in **open access in 2021**.
This journal uses a **CC BY** or a **CC BY-NC-ND** license.
→ Look up their [open access statement](#) and their [license terms](#).

JOURNAL METADATA

Publisher
[Elsevier](#), Netherlands
Manuscripts accepted in English

LCC subjects
[Medicine: Internal medicine: Neoplasms, Tumors, Oncology, Including cancer and carcinogens](#)
Keywords