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Employing Engineered Extracellular Vesicles to Treat Specific Tumours

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Abstract

Extracellular vesicles can be released by any cell, including prokaryotes and eukaryotes (EVs). EVs are vital for maintaining appropriate intercellular communication and internal environment balance because they include various cellular components such as RNA and surface proteins. EVs released from various tissues and cells have a wide range of features and functions (e.g., targeted specificity, regulatory ability, physical durability, and immunogenicity), making them a promising novel drug delivery and precision therapy alternative. The ability of EVs to transport anticancer medications for tumour therapy has been proven; additionally, the contents and surface material of EVs can be adjusted to improve their therapeutic efficacy in the clinic by increasing targeting potential and drug delivery effectiveness. By affecting the tumour microenvironment, EVs can control immune system function and hence slow tumour development.

Keywords: Eukaryotes • Cells • Media • Prokaryotes • EVs

Introduction

Many people have died as a result of tumours in recent decades. They continue to represent a major hazard to human health due to high recurrence and mortality rates, medication resistance, metastatic capabilities, and poor prognosis. Despite enormous developments in medical technology over the years, tumour therapy clinical outcomes remain unsatisfactory, owing mostly to a lack of site-specific drug targeting capability, which leads to inadequate chemotherapeutic effects [1-4].

Literature Review

Chemotherapy is one of the most common therapies for malignancies, but it has a number of drawbacks, including poor delivery efficiency, tissue resistance, and a lack of drug targeting abilities. Chemotherapeutic medicines' efficacy is further limited by low permeability and poor absorption in bodily fluids. These findings underscore the critical need for new medications and drug delivery methods that are effective, safe, and can be targeted to tumours. Several clinical trials and investigations have shown that extracellular vesicles can serve as good drug carriers and can boost therapeutic efficacy against malignancies in recent years [2].

They are found in blood, saliva, urine, tears, and cerebrospinal fluid, among other physiological fluids, and contain a wide range of genetic information. EVs are also biosafe, stable, and have good target selectivity because they are secreted by cells. They also offer the advantages of deep tissue penetration and a surface structure that is comparable to that of a cell membrane, allowing them to act as medication carriers at disease locations. EVs have a lot of potential in immunotherapy and precision medicine because of their unique biological behaviour. With the introduction of technology that allow them to be adjusted, such as loading contents, EVs can now be manipulated to improve drug delivery efficiency and target specificity, hence improving therapeutic outcomes for tumour patients. However, because to the wide range of cell differentiation states and EV composition, consistent EV isolation and modification approaches are lacking [3]. Exosomes are a form of EV that is small membrane vesicles that carry a range of chemicals. We refer to exosomes as "extracellular vesicles" throughout the review because only a few researches have shown that therapeutic EVs are exosomes. We refer to exosomes as "extracellular vesicles" throughout the review because only a few researches have shown that therapeutic EVs are exosomes. We concentrate on EV isolation technologies, modification approaches, and the therapeutic potential of EV-based drug delivery systems in this paper.

Discussion

Biological characteristics

Cholesterol, sphingomyelin, microRNAs (miRNAs), long non-coding RNAs (lncRNAs), and a variety of proteins involved in intercellular communication are abundant in EVs. Importantly, the cargo transported by EVs has the potential to play important pathophysiological roles, such as intercellular communication and immune responses. Apoptotic vesicles, which are >1000 nm in diameter; micro vesicles, which range from 100 to 1000 nm in diameter; and exosomes, which have diameters ranging between 30 and 100 nm, are nanoscale vesicles enclosed by cyto-membranes [5].

EVs acquisition

Based on their origins, EVs can be divided into three subtypes: cell culture-derived EVs, body fluid-derived EVs, and tissue-derived EVs. Cellular secretion, however, is the principal source of these vesicles because they are produced by cells into body fluids and tissues [6].

The cell culture medium, which facilitates cell proliferation and expansion, is a crucial predictor of EV yield for cell culture-derived EVs. To obtain cell culture-derived EVs, three different types of medium are being used: serum-containing medium, serum-free medium and chemical composition substitution. In particular, serum-free medium is routinely added with Human Platelet Lysate (HPL). When compared to serum-free media, serum-containing media is more favourable to cell proliferation and higher EV production. In serum-containing media, HPL, Foetal Bovine Serum (FBS), and human serum are often used, and these media induce significant cell proliferation. Importantly, media containing animal components, such as FBS, should be avoided when cells or products are used for medical purposes.

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Conclusion

Although there is limited information on serum concentrations in cell culture media, larger serum concentrations are not always preferable and should be kept within a tolerable range; however, this can vary depending on the cell line used to produce EVs. These technologies, however, are still in their infancy. They are still in their infancy and require a lot of investigation. Incubation of cells is still the most used method. There appear to be few gadgets that have been designed for this purpose. Obtaining EVs via large-scale cell culture, a problem that necessitates further research.

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Conflict of Interest

There is no conflict of interest of author towards this manuscript.

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