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Drug Delivery for Cancer Immunotherapy

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INTRODUCTION

The method used to deliver the medicine to the target body site for drug release and absorption, or the subsequent transport of the active components across biological membranes to the site of action, is referred to as drug delivery. The development of immunotherapy has ushered in a new era in cancer treatment. Not only do NPs play a significant role in the delivery of chemotherapy, but they also offer a lot of potential in immunotherapy. The anti-tumor immune response is primarily activated in cancer immunotherapy. Because complimentary ligands are attached to the surface of nanoparticles, they can only target malignant cells. Once the nanoparticles attach to the receptors, they undergo receptor mediated endocytosis or phagocytosis by cells, causing the encapsulated medication to be internalized by the cells. The method used to deliver the medicine to the target body site for drug release and absorption, or the subsequent transport of the active components across biological membranes to the site of action, is referred to as drug delivery.

DESCRIPTION

Immunotherapy is rapidly advancing as a cancer therapeutic option. The development of cancer immunotherapeutic regimens and combination treatments has been considerably aided by Drug Delivery Systems (DDSs). DDSs can offer tumour antigens, medicines, immunostimulatory chemicals, or adjuvants in a spatiotemporal manner, allowing immune cells such as Dendritic Cells (DCs) or T-cells to be modulated directly in *vivo* thus eliciting robust anticancer immune responses. Cancer vaccines, immune checkpoint inhibition, and adoptive cell transfer have all showed promise in the clinic, and the addition of DDSs could improve antitumor efficacy while reducing undesirable side effects. The utilization of nano, micro, and macro scale DDSs for co delivery of diverse immunostimulatory agents to reprogram the immune system to fight cancer is the subject of this review. We emphasize nanoparticle based tumour immune environment modulation or as an adjunct to gene therapy, photodynamic therapy, or photo thermal treatment when it comes to nanoparticle based DDSs. An overview of the carrier type, fabrication approach, and co delivery of tumour vaccines and adjuvants is provided for micro particle or capsule based DDSs. Finally, macro scale DDSs, such as hydrogels and scaffolds, are discussed, as well as their applications in tailored vaccine delivery and adoptive cell transfer therapy.

CONCLUSION

Cancer cells can evade immune monitoring and take advantage of the immune system to thrive and spread. With the advancement of nano and micro particles, a rising number of immunotherapy delivery methods have been created to activate innate and adaptive immune responses in the fight against cancer cells. This can be performed by teaching local immune cells to recognize and kill tumor associated antigen expressing cells, or by giving exogenous stimuli to increase tumour cell death in the immunosuppressive Tumour Micro Environment (TME). In cancer immunotherapy, medicines such as ipilimumab (Yervoy), nivolumab (Opdivo), pembrolizumab (Keytruda), atezolizumab (Tecentriq), avelumab (Bavencio), and aurvalumab (Imfinzi) are employed. Because nanoparticles can play a key role as a medication delivery method, nanotechnology has been intensively investigated and used for cancer treatment.

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