Cells As Delivery Vehicles

Maciej S. Lesniak

The University of Chicago, 5841 S. Maryland Ave, Chicago, IL 60637
mlesniak@surgery.bsd.uchicago.edu

ABSTRACT SUMMARY

One of the major impediments in drug delivery as well as delivery of biological therapies consists of achieving sufficient concentrations of the desired agent in the central nervous system (CNS). In order to overcome this concern, stem cells have been utilized as carriers of diverse agents to diseases of the CNS. This lecture will provide an overview of stem cell based therapeutics, with a special emphasis on gene therapy, immunotherapy, and nanotechnology, in the context of malignant brain cancer.

INTRODUCTION

Patients with glioblastoma multiforme (GBM), the most common and aggressive form of adult brain cancer, suffer from poor outcomes, even after undergoing surgery or radiotherapy in conjunction with chemotherapy. In the context of GBM treatment, biological therapies offer the potential to improve drug delivery by increasing drug half-life and allowing for controlled release. However, achieving an extensive yet specific distribution in a tumor is still a major challenge for such systems, especially when targets including diffuse infiltrating cancer cells are distant from the site of administration. While diffusion-based delivery of these systems has been attempted, it often results in poor intratumoral distribution and an inability to reach distant metastatic sites. Thus, a targeted delivery strategy is needed to ensure that only malignant tissue in the brain is affected.

Neural stem cells (NSCs), with their inherent tumor-tropic migratory capability, may offer an innovative approach for targeted delivery of anti-cancer agents to distant and diffuse tumor sites. Several groups, including our own, have reported the use of various targeted delivery approaches using NSCs as vehicles in xenograft models of human glioma. However, the use of such cell carriers is still in infancy. In this invited talk, we discuss the therapeutic options and limitations associated with using stem cells, including neural and mesenchymal stem cells, as delivery vehicles in CNS applications.

EXPERIMENTAL METHODS

This talk will cover the different approaches involved in using and loading stem cells with immunomodulatory genes, nanoparticles, and gene therapy vectors.

RESULTS AND DISCUSSION

Results of different publications pertaining to the use of cells as delivery vehicles will be presented, with an emphasis on malignant brain cancer. Translational work will be emphasized, and some of the current FDA approved clinical trials involving stem cells as carriers will be reviewed.

CONCLUSION

In summary, this talk will review the use of cells as carriers, emphasizing advances in gene therapy, immunotherapy, and nanotechnology. At the end, the audience will gain an increased appreciation for the challenges and opportunities associated with utilizing this approach in the clinical setting.

REFERENCES

None

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