

Multifunctional Liposome for Non-small Cell Lung Cancer Targeting and Theranostic MRI

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Introduction

Lung cancer is the main cause of cancer death worldwide, Non-small cell lung cancer (NSCLC) accounts most cases of lung cancer.¹ Although platinum-based doublet chemotherapy shows great application for NSCLC, novel treatments are warranted to improve survival rates. Here, a new combination treatment drug delivery system targeting for NSCLC was successfully developed, which contained a hydrophilic drug carboplatin and a hydrophobic drug paclitaxel. Except therapeutic effect, this multifunctional liposome can be detected by fluorescent technique and magnetic resonance imaging (MRI).

Material and Method

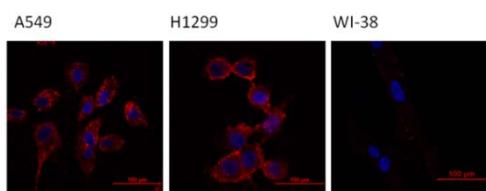


Fig.1. Binding of rhodamine labeled liposome in different cells.

Liposomes were prepared by the thin film hydration method. Rhodamine labeled liposome absorbed by tumor and normal cells could be clearly detected by LSCM. The nude mice transplanted with A549 cancer cells were intravenously injected with the multifunctional liposome solution via the tail vein, and the T_1 and T_1 weighted MR images were taken by 7T scanner.

Results and Discussion

c(RGDyK) modified liposome can target to tumor cell and be internalized via endocytosis, therefore induce apoptosis.² The cytotoxicity tests showed the synergistic effect of the combinations to H1299 and A549. By fluorescence microscopy in vitro (Fig.1) and MRI in vivo (Fig.2), this multifunctional liposome can effectively

target to NSCLC cells. The T_1 weighted MRI signal of the tumor can be improved greatly by Gd-DTPA-BMA loaded liposome, even much higher than conventional used contrast agent Omniscan®. The tumor growth can be effectively inhibited by administration of this liposome. Also the tumor size can be monitored visibly by MRI in real-time. For example, the tumor volume of the mouse turned to 13mm^3 from 23mm^3 at day10 of the therapy schedule (Fig.3). The tumor of the mice with saline increased more. There was no apparent acute toxicity in the mice during and after the test, which means this particle can be used in animal safely. These results showed the potential of this liposome for cancer therapy.

Conclusion

This new dual drug loaded multifunctional liposome system was successfully used as a theranostic agent for NSCLC of mice. Further applications may be done in studying and treating other solid tumors by this system.

References

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2. Desrosellier JS, Cheresh DA. Integrins in cancer: biological implications and therapeutic opportunities. *Nat Rev Cancer.* 2010;10(1): 9–22.

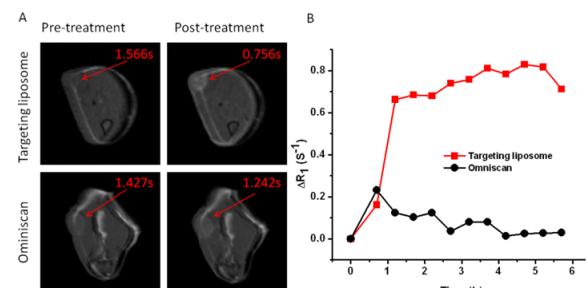


Fig.2. T_1 -weighted MR images(A) and ΔR_1 variation with the time(B).

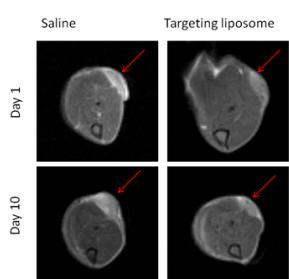


Fig.3. T_1 -weighted MR images of tumor.