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Epirubicin-loading fluorescent Qβ virus-like particles incorporated with CED for brain tumor therapy

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Glioblastoma multiforme (GBM) is known as the most lethal cancer among all astroglial tumors. The Blood-Brain Barrier (BBB) causes low efficiency in chemotherapy due to difficulty for drugs to cross BBB. Here, we describe an anti-cancer drug, epirubicin (Epi), loaded virus-like nanoparticles (VLPs) carrier system delivering drug and image tracking Green Fluorescent Protein (GFP) simultaneously by Convection-Enhanced Delivery (CED). VLPs are bio-nanomaterials which could be produced via *in vivo* protein expression and self-assembly in E. coli or other expression system. The VLPs have been described as new generation deliver platform for nucleic acid scaffold, protein and drug delivery. In this study, we package Epi in self-assembly GFP containing Qβ VLPs (Epi@gVLPs). The Epi@gVLPs were then modified with TAT peptide on the surface to form Epi@t-gVLPs which can enhance the cellular uptake efficiency, resulting in low IC50 (0.05-0.075 μg/mL) for GBM U87 cells as well as free Epi. To prove the anti-tumor ability in animal, the tumor-bearing mice were treated with gVLPs, free Epi or Epi@t-gVLPs by CED. We found that gVLPs are nontoxic to brain tissue. Conversely, the brain tissues will be corroded soon cause animal death when free Epi was directly injected in brain tumor. Interestingly, the brain tissues did not only get damaged but the tumor growth was inhibited as well when the tumor-bearing mice were treated with Epi@t-gVLPs by CED. The medium survival rate was prolonged to 42 days (single dose of Epi@t-gVLPs) compared to control group (27 days) and it was further prolonged to over 50 days after the mice received two doses of Epi@t-gVLPs. The results represented that Epi@t-gVLPs could be an advantageous delivering tool for slow toxic drugs release in company with CED to significantly enhance the tumor inhibition and toxicity reduction.

Biography

Hao-Han Pang has his Master's degree in Institute of Biomedical Sciences, National Sun Yat-sen University, Taiwan in 2017. He is currently a PhD student in National Sun Yat-sen University. His research interests are virus-like particles applications, RNA interference scaffold design and delivery platform development. The goal of his researches is to develop different applications of virus-like particles such as designed RNA packaging and drug delivery system for cancer therapy.

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