Hung-Wei Yang, J Cancer Sci Ther 2015, 7:8
http://dx.doi.org/10.4172/1948-5956.C1.057

OMICS International
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5th World Congress on
Cancer Therapy

September 28-30, 2015 Atlanta, USA

Gold nanorods-incorporated mesoporous magnetic nanoparticles for targeted drug delivery and near-infrared photothermal therapy in cancer

Hung-Wei Yang
Institute of Medical Science and Technology, National Sun Yat-sen University, Taiwan

Malignant brain tumors are central nervous system tumors that are almost always fatal. Patients treated by surgical resection, radiotherapy and chemotherapy survive, on average, for 6-24 months post-treatment. To date, surgery still is the primary treatment for brain tumor, following by chemotherapy is necessary to prevent the tumor recurrence. However, the passage of many potentially effective diagnostic or therapeutic agents from the circulating blood flow into brain tissues is limited by blood-brain barrier (BBB), resulting in the failure of chemotherapy. Thus, the treatment of various diseases by drug delivery to the brain is a particular challenge.

To overcome the problems, we report the design, synthesis, and evaluation of a targeted delivery system consisting of gold nanorods-incorporated mesoporous magnetic nanoparticles encoding with Apolipoprotein E-derived Peptide to enhance the penetration of BBB for targeted drug delivery and near-infrared photothermal therapy. Our preliminary data showed that the high aspect ratio gold nanorods were successfully conjugated on the surface of mesoporous magnetic nanoparticles and the saturated magnetization could be high to 68.5 emu/g. This delivery system could potentially allow safe delivery of other potent and toxic drugs into brain tumor tissues by crossing the BBB and provide dual-treatment for overcoming the biological complexity, and therapeutic challenges of some tumors which are currently considered difficult to treat.

Biography

Hung-Wei Yang received his M.S. and PhD. degrees in Chemical and Materials Engineering from Chang Gung University, in 2006 and 2011. After receiving the PhD. degree, he was a postdoctoral researcher in Chemical Engineering at National Tsing Hua University, Taiwan; and in Chemical and Biomolecular Engineering at Georgia Institute of Technology, Atlanta, USA. He is currently an assistant Professor in the Institute of Medical Science and Technology at National Sun Yat-sen University, Taiwan, from 2014. His current research includes studies of biomaterials synthesis for targeted drug/gene delivery, design/fabrication of biosensors, microneedle patches for hypodermic drug delivery/vaccination, and virus-like particles preparation as vaccine/small molecular drug/RNAi carriers.

howardyang@mail.nsysu.edu.tw, hwyang6868@gmail.com

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