

Gold Nanoparticle Mediated Optical Control Efficient Gene Knock Down in Breast Cancer

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INTRODUCTION

Advanced nanotechnologies and novel nanomaterials prompt the fast development of new protocols for biomedical application. The distinctive light-to-heat conversion property of gold based nano-scale materials can be utilized to produce novel and effective therapeutics for cancer management. Breast cancer is the most common cancer among women worldwide. Abnormally elevated expression of Cyclooxygenase-2 (COX-2) has been frequently observed to regulate tumor growth, invasion and metastasis in breast cancer tissues. COX-2 selective and non-selective inhibition causes several adverse effects like renal, cardiac and gastrointestinal toxicity. Herein, we have designed, a nano-platform comprising gold nanoparticles which incorporate and release COX-2 interfering oligos upon illumination with Near Infrared (NIR) Continuous Wave (CW) laser (808 nm) to specifically knockdown endogenous COX-2 expression in breast cancer cells. The COX-2 protein expression level was significantly ($p < 0.05$) reduced by 83% using gold nanoparticles conjugated oligos followed by NIR laser exposure compared to their untreated counterpart after 72 h. While gene silencing efficacy using nanoparticles conjugated

oligos without laser exposure was 36%. The decrease in protein level in NIR-activated cells versus control sample indicates that NIR triggered nano-platform has effectively interfered with COX-2 protein expression. Our findings emphasize that gold nanoparticle mediated laser transfection provides a potential gene interfering technique with spatial and temporal control, a novel molecular therapeutic approach for breast cancer treatment

BIOGRAPHY

Dr. Uzma Azeem Awan received her PhD in Biotechnology (Cancer Nanotheranostics) from University of Azad Jammu and Kashmir, Muzaffarabad, Pakistan and completed research project as visiting research fellow at Georgia institute of Technology (USA). Currently, she is working as Assistant Professor in department of Biological Sciences, National University of Medical Sciences (NUMS), Pakistan. Area of her current research interest lies at the crossroads between medical-biotechnology and advanced materials, in particular, in the fabrication and bioconjugation of metallic nanoparticles along with their biomedical applications such as gene interference, drug delivery and photothermal therapy. She has actively participated in national and international conferences.

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