OMICS International
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Jagat R Kanwar, J Cancer Sci Ther 2015, 7:6
http://dx.doi.org/10.4172/1948-5956.S1.047

Multifunctional locked nucleic acid modified chimeric survivin targeted nano-bullets against cancer stem cells

Jagat R Kanwar
Deakin University, Australia

Theranostics, the combination of diagnostics and therapies is a new concept in cancer management. Our published work strongly suggests that orally administered multifunctional targeted "nano-bullets" (nanocarriers; NCs) with iron saturated bovine lactoferrin (Fe-bLf) were able to kill tumours. Here for the first time, we are developed multifunctional-targeted nanocapsules conjugated with stably modified aptamers to target and kill cancer as well as cancer stem cells. These nanocapsules labeled with biosensors, will deliver anti-cancer molecules to colon tumours and help to monitor the therapy in real-time imaging. A cell permeable dominant negative mutant form of survivin (dNSurR9C84A), dNSurR9C84A has shown promising anticancer properties by inhibition of survivin and reduces the chance of side effects since survivin is not expressed in normal cells in an adult. However due to short half-life of dNSurR9C84A a drug delivery system based on low molecular weight chitosan was used which could prolong the bioavailability of dNSurR9C84A. These chitosan nanoparticles were well characterized before examining effects on colon cancer cells (Caco-2). The nanoparticle transport studies were carried out both in vitro and ex vivo in order to understand the mechanism of low molecular weight chitosan nanoparticles with intestinal cells. The in vivo Biodistribution studies showed a highly selective and specific patter of uptake of the targeted nanocarriers or "nanobullets" (CHNP-dNSurR9C84A-LNA-Nu+Ep) in the tumour. The targeted nanocarriers were also able to significantly inhibit the tumour volume up to a period of 95 days. These nanobullets showed specific internalization in cancer stem cells and led to cancer stem cells specific apoptosis, thus proved to be appropriate for oral administration in colon cancer.

Biography

Jagat Kanwar is group leader and head of the Nanomedicine and Laboratory of Immunology and Molecular Biomedical Research has an international reputation in investigating fundamental and applied molecular aspects of cancer and chronic inflammation. Our nanomedicine laboratory of immunology and molecular biomedical research (NLIMBR) is discovering the novel and safe targeted nanomedicine based nano-nutraceuticals for cancers, autoimmune disorders and inflammatory diseases. We also vested the molecular diagnosis including role of a non-invasive exosomes in blood, inflammatory sites and cancer tissues. Our research focused on cancer and inflammatory autoimmune diseases aims to investigate the underlying mechanisms involved in apoptosis, autophagy and inflammation by targeting the production of cytokines, chemokines, oxygen radicals and matrix metalloproteinase. Our research also aims to investigate the nanotherapeutics encapsulating peptides, LNA modified aptamers/miRNAs/siRNA in vivo models. We have made significant progress in field of ocular drug delivery and microfluidic and Lab-on-a-Chip devices techniques for cancer cells as well as stem cell capture, disease specific biomarkers and exosomes. His publications more than 150 research papers and have added to the body of knowledge in the fields of nanobiotechnology, cancer gene therapy, cell biology and immunology. Kanwar's research work has generated a total of 12 patent/PCTs. He is the member of various scientific committees and societies.

jagat.kanwar@deakin.edu.au

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