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ORAL PRESENTATION - Nanomedicine Approaches of Radioactive Gold Nanoparticles In Cancer Therapy

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The most practiced approach of drug delivery in cancer therapy over the last century has involved intravenous administration of cytotoxic chemotherapeutic or radionuclide-based nuclear medicine agents. Limited affinity of targeted chemotherapeutic agents or radiopharmaceuticals to tumor sites and also the vascular and interstitial transport barriers continue to pose vexing challenges in achieving optimal therapeutic payloads at tumor sites. Therefore, effective therapy of solid tumors continues to be an unmet clinical need. Gold nanoparticles, because of their size, inherent therapeutic properties and targeting capabilities provide unprecedented opportunities for intratumoral delivery and are thus poised for major advances in cancer oncology. Nanoparticles derived from ^{198}Au (a radioisotope of gold produced in nuclear reactors) are inherently therapeutic possessing ideal beta energy emission and half-life for effective destruction of tumor cells/tissue ($\beta_{\text{max}} = 0.96$ MeV; half-life of 2.7 days). We hypothesized that the intratumoral delivery of naturally available, non-toxic and FDA approved Gum Arabic functionalized radioactive gold nanoparticles (GA-AuNPs) will circumvent vascular and interstitial transport barriers resulting in targeted delivery of optimal therapeutic payloads with minimal/no toxicity to neighboring tissue. Detailed therapeutic efficacy studies in prostate tumor bearing SCID mice, injected with GA - $^{198}\text{AuNP}$ intratumorally, have demonstrated excellent retention of therapeutic payload (90%) and an overall tumor volume reduction of over 80% through a single intra tumor injection of GA- $^{198}\text{AuNPs}$ (1). These therapeutic efficacy data provide compelling impetus for the clinical translation of this novel nanotherapeutic agent for treating a variety of solid tumors which include prostate, pancreatic and hepatic tumors in human patients. This presentation will present latest results on the utility of radioactive gold nanoparticles in prostate tumor therapy. This lecture will focus on presenting the realistic potential of GA- $^{198}\text{AuNPs}$ in the effective treatment of hormone refractory prostate and other solid tumors which normally manifest resistance in response to traditional cell killing therapies. New oncological approaches toward extending survival of prostate cancer patients as the GA- $^{198}\text{AuNPs}$ transform tumors from fast propagating to static stages will also be discussed.

(1). Kannan and Katti et. al.: Functionalized Radioactive Gold Nanoparticles in Tumor Therapy. Wiley Interdisciplinary Reviews: Nanomedicine and Nanobiotechnology, Volume 4 Issue 1 (January/February 2012); Article first published online: 22 SEP 2011; DOI: 10.1002/wnan.161

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