In Vitro Toxicity Study of Gold and Tin Composite Nanodevices for use in Imaging and Radiotherapy

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Composite nanodevices, with PAMAM dendrimer and inorganic metal components, are currently being developed as an exciting nanoplatform for several types of molecularly targeted cancer therapy and imaging(1, 2). Due to the unique chemical structure of dendrimers, one can attach chemical moieties of interest on the surface and/or incorporate metal atoms or therapeutic compounds inside the dendrimer molecules to form composite nanoparticles with specific use(1-4).

In this study we evaluate the toxicity of three types of composite nanodevices (Au-CND, Sn-CND and Au-Sn-CND). Toxicity was assessed using *in vitro* proliferation assay (XTT assay) in a prostate cancer cell line and in primary human endothelial culture cells (normal cells). The concentration (physiologic range and high concentration levels) of composite nanodevices assessed in the toxicity study was in the range of 10 nM – 2 μM over time. First we examine Au dendrimer composite nanodevices (Au-CND), one being developed as a radiotherapy agent, since ^{198}Au has already been used in radiotherapy(5). Tin (Sn) also has potential for use in X-ray based contrast imaging, and we examine the toxicity of Sn based composite nanodevices (Sn-CND). We also tested the toxicity of a hybrid metal device, 5 nm composite nanodevice Au-Sn-CND, which has a potential for being a cancer therapeutic and imaging agent. Prior to any human use, these devices will need to be evaluated for cellular toxicity.

This study demonstrates the range of safety (lack of toxicity) of these metal composite nanodevices in both tumor and normal cell systems, and at physiologic concentrations as well as high concentration levels.

Keywords: PAMAM composite nanodevice, toxicity, cancer therapy, imaging

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