Malignant melanoma is the sixth most common cancer diagnosed in the United States. Surgery, chemotherapy and radiation are some of the successful techniques in killing tumor cells. However, in these techniques, it is not easy to distinguish tumor cells from the healthy ones which inadvertently get exposed to chemical agent/radiation. Therefore it is required to develop an anti-cancer agent which selectively kills the cancer cells, while still protecting the normal tissues. In our preliminary work, we have shown that Dextran (1000Da) coated Cerium oxide nanoparticles (Dex-CNPs) selectively kills the cancer cells (50% killing at a concentration of 150µM) without inducing toxicity to normal cells. However, the mechanism involved on how CNPs/Dex-CNPs attain the selectivity and efficiently kill the tumor cells is still unknown. In this study we have synthesized Dextran coated ceria nanoparticles (Dex-CNPs) with different surface oxidation state ratio (Ce4+/Ce3+). This will provide an in depth understanding of the key chemical and physical properties of the system that can improve its efficacy. The varied surface oxidation of the particles is achieved by exposing Dex-CNPs to light which initiates a color change from dark to pale yellow indicating the reduction of Ce4+ to Ce3+. Interestingly we have found that the Dex-CNPs exposed to light have reduced cytotoxicity towards squamous cell carcinoma cell line (CCL30) compared to the protected ones. Characterization of the same revealed that Dex-CNPs exposed to light have decreased Ce4+ /Ce3+ surface oxidation ratio compared to the other. This provides more insight in useful synthesis of Dex-CNPs in terms of storage and handling. In summary, higher Ce4+ /Ce3+ surface oxidation ratio is more efficient in hindering tumor growth by effectively hindering the tumor-stoma interaction.