In vitro Validation of ROS Nanosensors in Renal Cancer Cells

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This research aims to synthesize and validate gold-based nanosensors that will be able to measure the concentration of hydrogen peroxide (H2O2) and thus differentiate renal cancer cells from normal cells. Non-fluorescent carboxy-H2DCFDA, which becomes green fluorescent when it is oxidized, was conjugated to gold nanoparticles (AuNPs) to detect H2O2. Therefore, it was hypothesized that: (1) carboxy-H2DCFDA conjugated gold nanoparticles (carboxy-AuNPs) will be more sensitive in detecting H2O2 than carboxy-H2DCFDA and (2) compared to normal cells, renal cancer cells treated with carboxy-AuNPs will show higher values of fluorescence intensity. The saturated concentration of carboxy-H2DCFDA in 1mL of AuNPs was obtained to be 10μL/mL through the experiment performed with a spectrophotometer. The carboxy-AuNPs was tested its sensitivity in detecting 100mM of H2O2 with a fluorescence plate reader and it was 11.6 times more sensitive than carboxy-H2DCFDA. The kidney cell line (293T) and the renal cancer cell lines (786-O and A498) were harvested and plated for the fluorescence intensity test. When applied to the cells, carboxy-AuNPs showed lower values of fluorescence intensity compared to carboxy-H2DCFDA. Interestingly, however, carboxy-H2DCFDA could differentiate normal cells from renal cancer cells based on their fluorescence intensity values. Therefore, this research suggests that carboxy-H2DCFDA can be applied to cells to detect the presence of H2O2 and possibly differentiate the cancer cells from normal cells based on their fluorescence intensity values. It also suggests that the sensitivity of carboxy-H2DCFDA in cells cannot be enhanced by the gold nanoparticles.

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