The potential of 211Astatine for NIS-mediated radionuclide therapy in prostate cancer.

Abstract:
PURPOSE: We reported recently the induction of selective iodide uptake in prostate cancer cells (LNCaP) by prostate-specific antigen (PSA) promoter-directed sodium iodide symporter (NIS) expression that allowed a significant therapeutic effect of (131)I. In the current study, we studied the potential of the high-energy alpha-emitter (211)At, also transported by NIS, as an alternative radionuclide after NIS gene transfer in tumors with limited therapeutic efficacy of (131)I due to rapid iodide efflux. METHODS: We investigated uptake and therapeutic efficacy of (211)At in LNCaP cells stably expressing NIS under the control of the PSA promoter (NP-1) in vitro and in vivo. RESULTS: NP-1 cells concentrated (211)At in a perchlorate-sensitive manner, which allowed a dramatic therapeutic effect in vitro. After intraperitoneal injection of (211)At (1 MBq), NP-1 tumors accumulated approximately 16% ID/g (211)At (effective half-life 4.6 h), which resulted in a tumor-absorbed dose of $1,580_{-345}^{+}_{-345}$ mGy/MBq and a significant tumor volume reduction of up to 82+/−19%, while control tumors continued their growth exponentially. CONCLUSIONS: A significant therapeutic effect of (211)At has been demonstrated in prostate cancer after PSA promoter-directed NIS gene transfer in vitro and in vivo suggesting a potential role for (211)At as an attractive alternative radioisotope for...
NIS-targeted radionuclide therapy, in particular in smaller tumors with limited radionuclide retention time.