Application of 188rhenium as an alternative radionuclide for treatment of prostate cancer after tumor-specific sodium iodide symporter gene expression.

CONTEXT: We reported recently the induction of iodide accumulation in prostate cancer cells (LNCaP) by prostate-specific antigen promoter-directed sodium iodide symporter (NIS) expression that allowed a significant therapeutic effect of $^{131}$Iodine ($^{131}$I). These data demonstrated the potential of the NIS gene as a novel therapeutic gene, although in some extrathyroidal tumors, therapeutic efficacy may be limited by rapid iodide efflux due to a lack of iodide organification.

OBJECTIVE: In the current study, we therefore studied the potential of $^{188}$rhenium ($^{188}$Re), as an alternative radionuclide, also transported by NIS, with a shorter half-life and higher energy beta-particles than $^{131}$I. RESULTS: NIS-transfected LNCaP cells (NP-1) concentrated 8% of the total applied activity of $^{188}$Re as compared with 16% of $^{125}$I, which was sufficient for a therapeutic effect in an in vitro clonogenic assay. gamma-Camera imaging of NP-1 cell xenografts in nude mice revealed accumulation of 8-16% injected dose (ID)/g ($^{188}$Re (biological half-life 12.9 h), which resulted in a 4.7-fold increased tumor absorbed dose (450 mGy/MBq) for ($^{188}$Re as compared with ($^{131}$I). After application of 55.5 MBq ($^{131}$I or ($^{188}$Re, smaller tumors showed a similar average volume reduction of
86%, whereas in larger tumors volume reduction was significantly increased from 73% after (131)I
treatment to 85% after application of (188)Re. CONCLUSION: Although in smaller prostate cancer
xenografts both radionuclides seemed to be equally effective after prostate-specific antigen
promoter-mediated NIS gene delivery, a superior therapeutic effect has been demonstrated for
(188)Re in larger tumors.