

Theranostic gadolinium-based nanoprobcs to improve radiotherapy

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Abstract

A gadolinium-based theranostic agents (AGuIX)[®] has been developed for image-guided radiation therapy. These particles consist of a polysiloxane network surrounded by gadolinium chelates. Due to their small size (< 5 nm), the nanoparticles so-called AGuIX[®] are characterized by renal clearance without any undesired accumulation in healthy tissues, properties which confer to the particles some optimal characteristics for both diagnostic and therapeutic purposes. Due to the particular tumor vascularization, the AGuIX are able to passively accumulated in solid tumors by EPR (Enhanced Permeability and Retention) effect. The radiosensitizing effect of the particles has been demonstrated on B16F10 cells, a highly metastatic and radioresistant mouse melanoma cell line. *In vitro*, the particles were significantly able to improve the biological effect of radiation, at 2 and 5 Gy with an enhancing factor of 14% and 35% respectively as compared to radiation alone. Similar *in vivo* effect has been demonstrated when tumors cells were implanted into mouse brain, with a significant improvement of the animals half live as compared to radiation treatment.

In addition to the highly favorable safety evaluation of the particles, these results demonstrated a promising translation to the clinic in the near future, in particular for patients with multiple brain melanoma metastases.