Evaluation of the potential of $^{99m}$Tc-PEI-MP for diagnosis and follow-up, in a comparative study using in vivo models of bladder cancer and osteosarcoma

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Introduction: The aim of this study was to evaluate in vivo the efficacy of $^{99m}$Tc-PEI-MP (polyethyleneimonomethyl phosphonic acid) for diagnosis of bladder cancer and osteosarcoma.

Material and Methods: Radiochemical purity of $^{99m}$Tc-PEI-MP was achieved using ascending microchromatography. Studies were performed using six groups of Balb/c nu/nu mice: two normal, two with bladder carcinoma xenotransplants and two with osteosarcoma xenotransplants, all injected with Na$^{99m}$TcO$_4$ and $^{99m}$Tc-PEI-MP. Dynamic and static images were acquired during 2 and 4 hours after i.v. radiopharmaceuticals administration. Mice were euthanized immediately after the completion of the respective imaging sections and organ samples where weighted and counted in a well-counter to obtain percentage injected activity per gram of organ.

Results: The biodistribution results obtained with $^{99m}$Tc-PEI-MP showed that the excretion occurs primarily through the renal system. Tumor/muscle ratio of $^{99m}$Tc-PEI-MP was >1 for both types of cancer (ranging between 1.4-3.0). Tumor/bladder, tumor/liver, tumor/lung and tumor/bone ratios of $^{99m}$Tc-PEI-MP were consistently <1
for both types of cancer, respectively ranging between 0.06-0.42 (bladder), 0.18-0.84 (liver), 0.19-0.65 (lung) and 0.14-0.20 (bone). The biodistribution results obtained with Na$^{99m}$TcO$_4$ demonstrated the normal expectable biodistribution.

**Conclusions:** Although biodistribution demonstrated a high uptake by bladder and bone tumors, it was also high for bone, liver and lung. Therefore, for distant metastasis search $^{99m}$Tc-PEI-MP is not useful. However, considering the high tumor/muscle ratio, $^{99m}$Tc-PEI-MP could be eventually considered useful for muscular metastasis detection.

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