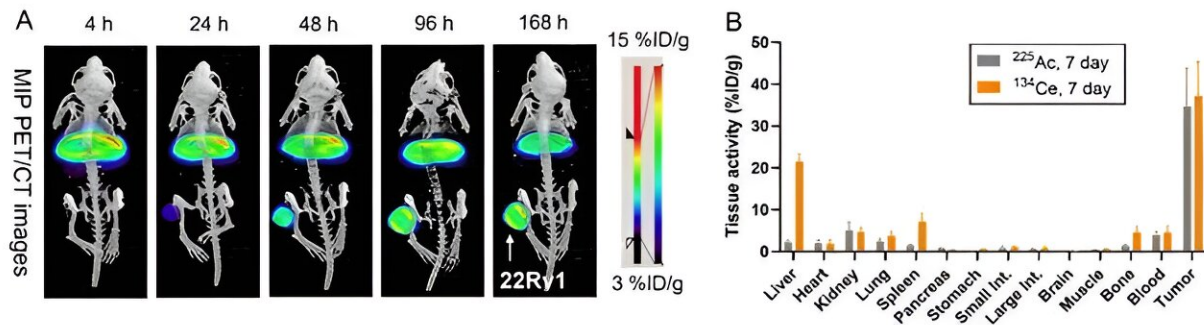


# Transforming cancer diagnosis and treatment with cerium/lanthanum-134

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Cerium/lanthanum-134-based radiopharmaceuticals have promise for prostate cancer imaging and therapy. Right, tumors show high tumor uptake of cerium-134. Left, a comparison of cerium-134 and actinium-225 shows a similar pattern of uptake in most tissues. Credit: Bobba, K.N., et al., Evaluation of cerium/lanthanum-134 as a PET imaging theranostic pair for  $^{225}\text{Ac}$  alpha radiotherapeutics. *Journal of Nuclear Medicine*

Actinium-targeted alpha radiotherapy is a promising approach for treating metastatic cancers, including prostate cancer. This approach requires doctors to obtain images of the radiotherapy agent as it moves to tumors, a process called molecular imaging. Attaching a radioisotope to a chemical compound is called radiolabeling. Conducting a molecular imaging study with a radiolabeled compound allows doctors to plan treatments.

However, this imaging step is not possible with therapeutic substances labeled with actinium-225 (Ac-225). A desired imaging isotope must be similar to Ac-225's half-life and chemistry and also provide a decay emission that allows for imaging; few such isotopes exist. Researchers have proposed using cerium/lanthanum-134 as an imaging material for Ac-225. This study examined the performance of cerium-134 (Ce-134) as an imaging surrogate in combination with Ac-225.

To make cancer treatments successful, doctors must perform imaging to help guide their therapy decisions. Ac-225 therapy demonstrates great promise for prostate and other cancers. To make this radioisotope more useful, this research developed a single molecular platform for imaging and radiotherapy using Ac-225 and Ce-134. The results demonstrate similar tumor uptake for Ce-134 and Ac-225 in [prostate cancer](#) models. This means that imaging with Ce-134-labeled radiopharmaceuticals has the potential to guide the therapeutic dosing of Ac-225-labeled therapy agents.

Theranostics is an emerging field combining imaging and therapy, allowing a personalized approach to treating cancer and other diseases. The use of theranostics in [nuclear medicine](#) has been shown to be highly effective in treating certain types of cancer, such as [neuroendocrine tumors](#) and prostate cancer.

Research has shown that actinium-225 (half-life = 9.9 days) based targeted alpha therapies are effective in treating metastatic castration-resistant prostate cancers, significantly improving patient survival and disease remission. Unfortunately, localization and accurate dose estimation are a considerable challenge due to the lack of imaging isotopes with similar half-life and chemistry to actinium-225. Recently, researchers developed a cerium/lanthanum-134 pair as an imaging surrogate to overcome these challenges.

In this study published in the *Journal of Nuclear Medicine*, researchers from the University of California, San Francisco and the University of Virginia developed a robust cerium-134 radiolabeling methodology using the chelators Macropa and DOTA. They also applied the optimized method for prostate cancer targeting agents PSMA-617 and antibody YS5.

Encouragingly, the localization of cerium/lanthanum-134 Macropa-PEG4-YS5 demonstrated identical distribution in most tissues along with tumors except for the liver and spleen. The researchers believe this is the first report of a comprehensive study comparing the chemistry and localization of Ce-134 and Ac-225, starting from chelators to tumor-targeting agents. These studies support the development of Ce-134 radiopharmaceuticals for [cancer](#) imaging as a companion paired with alpha particle radiotherapeutics. Both Ac-225 and Ce-134 are available from the Department of Energy Isotope Program.

**More information:** Kondapa Naidu Bobba et al, Evaluation of  $^{134}\text{Ce}/^{134}\text{La}$  as a PET Imaging Theranostic Pair for  $^{225}\text{Ac}$   $\alpha$ -Radiotherapeutics, *Journal of Nuclear Medicine* (2023). [DOI: 10.2967/jnumed.122.265355](https://doi.org/10.2967/jnumed.122.265355)

Tyler A. Bailey et al, Evaluation of  $^{134}\text{Ce}$  as a PET imaging surrogate for antibody drug conjugates incorporating  $^{225}\text{Ac}$ , *Nuclear Medicine and Biology* (2022). [DOI: 10.1016/j.nucmedbio.2022.04.007](https://doi.org/10.1016/j.nucmedbio.2022.04.007)

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