

Synthesis of Novel (Technetium-99m)-(DOTA-NHS-ester)-Methionine Radio Drug as a SPECT-CT Imaging Candidate

Paria Mojarad^a, Mehdi Shafiee Ardestani^{b*}

Authors' Affiliations:

^a Faculty of Pharmacy, International Campus, Tehran University of Medical Sciences International Campus (TUMS-IC), Tehran, Iran;

^b Department of Radiopharmacy, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran;

Abstract Presenter:

Paria Mojarad; Pharm.D., Faculty of Pharmacy, International Campus, Tehran University of Medical Sciences International Campus (TUMS-IC), Tehran, Iran;

E-mail: paria.mojarad@yahoo.com

*Correspondance:

Mehdi Shafiee Ardestani; PhD., Department of Radiopharmacy, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran;

E-mail: shafieeardestani@tums.ac.ir
shafieeardestani@gmail.com

Abstract

Cancer is a disease in which a group of cells show an uncontrolled growth (Cell division beyond the normal range), invasion (Penetration into and destruction of adjacent tissues), and in some cases, metastasis (Spreading to other parts of the body via lymph or blood systems). These three destructive nature of cancerous tumors distinguish them from benign tumors. Undoubtedly, early detection of cancer is associated with an increased survival of these patients.

Introduction

SPECT/CT (Single Photon Emission Computed Tomography) give us a signal for cancer diagnosis. The use of radiopharmaceuticals such as technetium improves images. Technetium is one of the famous contrast agent used in this technique, which is toxic and should be used as a complex with a ligand.

In this study (Technetium-99m)-(DOTA-NHS-ester)-Methionine radio drug was synthesized. Technetium-99m is an isomer of isotope-^{99m}Tc, which is attempted by isomeric transition. Methionine is an essential amino acid which has important roles in cancerous cells. DOTA was used to conjugate with Methionine and then labeled with ^{99m}Tc to improve tumor selectivity. This synthesized radio drug would be able to nominate as a SPECT-CT imaging candidate.

Methods and results

In this current study, a novel structure of DOTA-NHS ester conjugated to essential amino acid methionine was synthesized, and then labeled by a radionuclide technetium. The final radiopharmaceutical characterized and then studied as a contrast agent in SPECT/CT imaging.

Conclusion

(Technetium-99m)-(DOTA-NHS-ester)-Methionine synthesized radio drug showed significant ($P < 0.05$) Cellular uptake in cancerous cells in comparison with other normal cells and Cellular toxicity was observed in those cancerous cell lines.

According to the final data, the synthesized radiopharmaceutical, was detected in the tumor with high and significant appearance in SPECT/CT technique.

Keywords

Molecular imaging; SPECT/CT; Technetium; Radiopharmaceutical; DOTA; Methionine