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Development of ^{99m}TC-Ciprofloxacin Kit

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Structured Abstract

Background: Conventional diagnostic approaches frequently lack precision in detecting bacterial infections that are located deep within the body. The existing imaging technologies also struggle to distinguish infections from other medical disorders. Radiolabeled antimicrobial, such as ^{99m}Tc-ciprofloxacin, was given attention due to their ability to identify bacterial infection sites precisely. The objective of this research project is to prepare ^{99m}Tc-ciprofloxacin and optimize its labeling process for higher yield. Several aspects were investigated in this study including the amount of reducing agent $SnCl_2$ needed, reaction temperature, and the influence of filtration at post-radiolabeling.

Methods: ^{99m}Tc was acquired via a ^{99}Mo/^{99}mTc generator. A mixture of fixed amount of (conc) ciprofloxacin and variety of $SnCl_2$ amount of 30, 60, and 100 µg were investigated for yield. 1 ml of ^{99m}Tc solution (activity mCi) was then added into each mixture. The pH was adjusted to 6 using 1M NaOH, and the solution was filtered through a 0.22 µm cellulose acetate membrane following 15 incubation. Various reaction temperature (RT, 40 and 60°C), radioactivity and the retain activity pre and post filtration were investigated. The preparation was then assessed for its radiochemical purity yield via radio thin layer chromatography test (ITLC-SG) using two mobile phase that were acetone solution and mixture solution (ethanol, water and ammonia; 4:2:1 respectively).

Results: The use of 60 µg of $SnCl_2$ showed to provide maximum yield of 91.63% ^{99m}Tc-ciprofloxacin at post-filtration. Filtration at post preparation showed to be critical to reducing the presence of free $^{99m}TcO^{-1}$ and hydrolysed technetium, as well as further enhancing the purity of ^{99m}Tc-ciprofloxacin. Additionally, the study determined that the optimal temperature for radiolabelling was 60°C (% yield). The presence of nitrogen gas purging prior to addition of ^{99m}Tc is important to enable the reaction to happen as it will effectively removes oxygen and prevents oxidative degradation of $^{99m}TcO^{-1}$.

Conclusion: In conclusion, this study successfully optimised the preparation of ^{99m}Tc-ciprofloxacin, achieving a maximum yield of 91.63% using 60 µg of $SnCl_2$, filtration at post preparation and 60°C with nitrogen gas purging. These findings contribute to the development of cost-effective and precise diagnostic tools for detecting bacterial infections.

Keywords: Nuclear medical imaging , ^{99m}Tc, Ciprofloxacin, ^{99m}Tc-ciprofloxacin, infection diagnosis

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