

(TECHNOLOGISTS PROGRAM)

(Proposed to be presented as Oral Communication or as a Poster)

Abstracts List of Topics:

Physics & Instrumentation & Data Analysis

305. Quality Control & Systems

Abstract Title:

Practical Quality Control: Comparison of Methods on the Quantification of Stationary Phases in Paper and Thin-Layer Chromatographic Systems

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Abstract Text:

Introduction: Paper and thin layer chromatography methods are frequently used in Classic Nuclear Medicine for the determination of radiochemical purity (RCP) on radiopharmaceutical preparations. An aliquot of the radiopharmaceutical to be tested is spotted at the origin of a chromatographic strip (stationary phase), which in turn is placed in a chromatographic chamber in order to separate and quantify radiochemical species present in the radiopharmaceutical preparation. There are several methods for the RCP measurement, based on the use of equipment as dose calibrators, well scintillation counters, radiochromatographic scanners and gamma cameras. The purpose of this study was to compare these quantification methods for the determination of RCP.

Material and Methods: ^{99m}Tc -Tetrofosmin and ^{99m}Tc -HDP are the radiopharmaceuticals chosen to serve as the basis for this study. For the determination of RCP of ^{99m}Tc -Tetrofosmin we used ITLC-SG (2.5 x 10 cm) and 2-butanone (^{99m}Tc -tetrofosmin Rf = 0.55, $^{99m}\text{TcO}_4^-$ Rf = 1.0, other labeled impurities ^{99m}Tc -RH RF = 0.0). For the determination of RCP of ^{99m}Tc -HDP, Whatman 31ET and acetone was used (^{99m}Tc -HDP Rf = 0.0, $^{99m}\text{TcO}_4^-$ Rf = 1.0, other labeled impurities RF = 0.0). After the development of the solvent front, the strips were allowed to dry and then imaged on the gamma camera (256x256 matrix; zoom 2; LEHR parallel-hole collimator; 5-minute image) and on the radiochromatogram scanner. Then, strips were cut in Rf 0.8 in the case of ^{99m}Tc -tetrofosmin and Rf 0.5 in the case of ^{99m}Tc -HDP. The resultant pieces were smashed in an assay tube (to minimize the effect of counting geometry) and counted in the dose calibrator and in the well scintillation counter (during 1 minute). The RCP was calculated using the formula: % ^{99m}Tc -Complex = [^{99m}Tc -Complex] / (Total amount of ^{99m}Tc -labeled species) x 100. Statistical analysis was done using the test of hypotheses for the difference between means in independent samples.

Results: The gamma camera based method demonstrated higher operator-dependency (especially concerning the drawing of the ROIs) and the measures obtained using the dose calibrator are very sensitive to the amount of activity spotted in the chromatographic strip, so the use of a minimum of 3.7 MBq activity is essential to minimize quantification errors. Radiochromatographic scanner and well scintillation counter showed concordant results and demonstrated the higher level of precision.

Conclusions: Radiochromatographic scanners and well scintillation counters based methods demonstrate to be the most accurate and less operator-dependant methods.

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