

Study on the Preparation of Some ^{99m}Tc - Radiopharmaceuticals Freeze Dried Kits for Medical Uses

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالُوا سُبْحَانَكَ

لَا عِلْمَ لَنَا إِلَّا بِمَا عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

الْحَقُّ
الْعَظِيمُ

سورة البقرة آية (٣٢)

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Radiopharmaceutical Freeze Dried Kits For
Medical Uses}**

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DEDICATED: to my mother
to my father
to my husband
to my sons
nehad and hamza
to my daughter
samer

AIM OF THE WORK

Tc-99m is the most commonly used radioisotope in diagnostic nuclear medicine due to its nearly ideal physical and nuclear properties. Tc-99m can be separated from its parent ^{99}Mo by different methods. Tc-99m generator, based on chromatographic alumina column loaded with fission ^{99}Mo , is the most commonly used generator in nuclear medicine departments. The acceptance of this system depends on its very high specific activity fission produced ^{99}Mo . But due to the difficulties in the separation and purification processes of ^{99}Mo which are very tedious, in addition to several other problems such as storage of very high radioactive waste, this technology is not applicable in countries which do not have high neutron flux reactors. Other alternative generators are investigated. Tc-99m generators using medium to low specific activity (n, γ) produced ^{99}Mo are developed. The research effort has been aimed at developing a simple, compact and transportable generator for safe use in a hospital environment.

One of the approach towards achieving this goal was the preparation of $^{99\text{m}}\text{Tc}$ gel generator. This generator contains fairly soluble high content of molybdenum chemically combined in the gel matrix. The zirconium molybdate gel and zirconium molybdophosphate gel are reported to contain about 25% by weight of molybdenum .

The main purpose of this work is to prepare a gel type $^{99\text{m}}\text{Tc}$ -generator using (n, γ) ^{99}Mo of low and medium specific activity which produced by thermal irradiation of MoO_3 as a target material in 2MW water-cooled Egyptian Research Reactor (ERR-1) at Inshas , Egypt, in neutron flux $1.3 \times 10^{13} \text{ n. cm}^{-2} . \text{ sec}^{-1}$.

The preparation of $^{99\text{m}}\text{Tc}$ gel type generator is based on the use of zirconium molybdophosphate- ^{99}Mo gel type .

The present study also describes the influence of formulation variables on gel properties and performance of this generator using tracer levels of ^{99}Mo . The effect of some parameters such as molar ratio of the reactants, pH of the reaction mixture, backing and drying temperature, and the digestion time have to be investigated. The elution performance of $^{99\text{m}}\text{Tc}$ from zirconium molybdophosphate - ^{99}Mo gel and the quality control tests of $^{99\text{m}}\text{Tc}$ eluate have also to be study.

The main goals of the second part of this work were to synthesize 3-bromo-2,4,6- trimethylacetanilido-iminodiacetic acid(Br-IDA,mebrofenin) which is used as a hepatobiliary imaging agent after labelling with $^{99\text{m}}\text{Tc}$.The present work also includes study of different parameters affecting the labelling yield such as Br-IDA content,Sn Cl_2 content, pH of the reaction mixture and reaction time in order to choose the best conditions for obtaining high purity ,high quality, in-vitro and in-vivo stability. Similarly, the same study has to be performed on gluconate compound. Biological distribution of $^{99\text{m}}\text{Tc}$ -Br-IDA and $^{99\text{m}}\text{Tc}$ -gluconate had investigated in mice .

CONTENTS

| | |
|-----------------|--|
| LIST OF TABLES | |
| LIST OF FIGURES | |
| ABSTRACT | |
| SUMMARY | |

CHAPTER 1

| | |
|---|----------|
| I. General Introduction | 1 |
| I.1 Technetium | 2 |
| I.1.1 Chemistry of technetium | 2 |
| I.2 Sources of ^{99m}Tc | 4 |
| I.3 Methods of technetium - ^{99m}Tc separation | 4 |
| I.3.1 Radionuclide generators systems | 4 |
| I.3.2 Types of generator system. | 5 |
| I.3.2.1 Chromatographic generator. | 5 |
| I.3.2.2 Solvent extraction generator. | 5 |
| I.3.2.3 Sublimation generator. | 6 |
| I.3.2.4 Gel generator | 6 |
| I.4 Labelling with ^{99m}Tc | 7 |
| I.4.1 ^{99m}Tc complexes. | 8 |
| I.5 ^{99m}Tc - radiopharmaceuticals | 9 |
| I.5.1 ^{99m}Tc - pertechnetate. | 9 |
| I.5.2 ^{99m}Tc - chelates for skeletal imaging. | 10 |
| I.5.3 ^{99m}Tc - chelates for renal imaging . | 10 |
| I.5.4 ^{99m}Tc - chelates for hepatobiliary imaging. | 11 |
| I.5.5 ^{99m}Tc -chelates for myocardial imaging. | 12 |
| I.5.6 ^{99m}Tc - complexes for brain imaging. | 12 |
| I.6 Freeze drying. | 13 |
| I.7 Kit preparation | 15 |
| I.8 Quality control | 17 |
| I.8.1 Determination of the moisture content. | 17 |
| I.8.2 Determination of the Sn (II) content. | 17 |
| I.8.3 Physiochemical tests. | 18 |
| I.8.3.1 Determination of the radionuclidic purity. | 18 |
| I.8.3.2 Determination of the radiochemical purity. | 18 |
| I.8.4 Biological tests | 19 |
| I.8.4.1 Biodistribution | 19 |
| I.8.4.2 Sterility | 19 |
| I.8.4.3 Apyrogenicity | 20 |
| I.8.4.4 Toxicity | 20 |

CHAPTER II

⁹⁹Mo-^{99m}Tc Gel Generator

| | | |
|------------|---|----|
| II.1 | Introduction | 21 |
| II.1.1 | Chromatographic generator | 23 |
| II.1.2 | Solvent extraction generator | 25 |
| II.1.3 | Sublimation generator. | 26 |
| II.1.4 | Gel generator | 27 |
| II.2 | Experimental | 29 |
| II.2.1 | Chemicals and reagents. | 29 |
| II.2.2 | Equipments | 30 |
| II.2.3 | Preparation of stock solutions | 31 |
| II.2.3.1 | Preparation of stock molybdenum solution | 31 |
| II.2.3.2 | Preparation of zirconyl chloride stock solution | 31 |
| II.2.3.3 | Preparation of sodium-molybdate- ⁹⁹ Mo solution | 31 |
| II.2.3.4 | Preparation of molybdophosphate stock solution. | 31 |
| II.2.3.5 | Preparation of ferrousammoniumsulphate 10% | 32 |
| II.2.3.6 | Preparation of stannous chloride dihydrate stock solution. | 32 |
| II.2.4 | Gel preparation | 32 |
| II.2.4.1 | Effect of gel preparation conditions . | 32 |
| II.2.4.1.1 | Effect of molar ratios of the Mo and Zr. | 33 |
| II.2.4.1.2 | Effect of pH of the reaction mixture . | 33 |
| II.2.4.1.3 | Effect of reaction temperature | 33 |
| II.2.4.1.4 | Effect of digestion time. | 33 |
| II.2.4.1.5 | Effect of drying temperature. | 33 |
| II.2.5 | Gel analysis. | 34 |
| II.2.5.1 | Determination of molybdenum content. | 34 |
| II.2.5.2 | Determination of zirconium content spectrophotometrically. | 36 |
| II.2.5.3 | Determination of phosphorous radiometrically | 37 |
| II.2.5.4 | Determination of water content. | 37 |
| II.2.6 | Column study. | 38 |
| II.2.6.1 | Packing of the column. | 38 |
| II.2.6.2 | Elution profile. | 38 |
| II.2.6.3 | ^{99m} Tc elution efficiency. | 38 |
| II.2.7 | Quality control of ^{99m} Tc eluate. | 38 |
| II.2.7.1 | Determination of the radionuclidic purity. | 38 |
| II.2.7.2 | Determination of the radiochemical purity | 39 |
| II.2.7.3 | Determination of the chemical purity. | 39 |
| II.2.7.4 | Determination of sterility. | 40 |
| II.2.7.5 | Determination of apyrogenicity . | 40 |
| II.2.7.6 | Determination of biodistribution of ^{99m} TcO ₄ ⁻ eluted from the gel column generator in mice | 40 |