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

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bY

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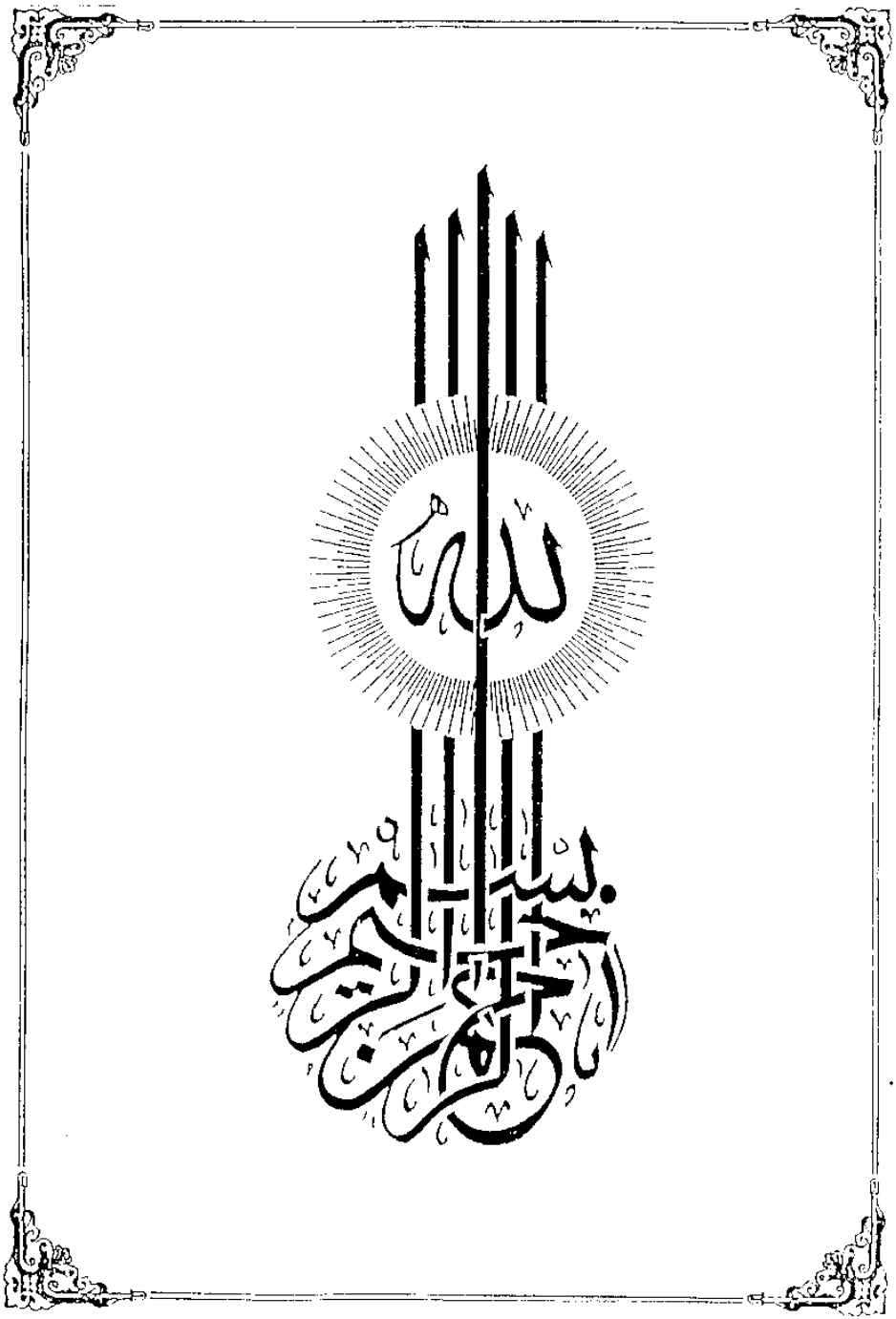

بسم الله الرحمن الرحيم

قالوا سبحانك

لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم

صدق الله العظيم

سورة البقرة آية (٣٢)

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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 ^{99m}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 ^{99m}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 $1.3x10^{13}$ n. cm^{-2}. sec^{-1} .

The preparation of ^{99m}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 ^{99m}Tc from zirconium molybdophosphate - ^{99}Mo gel and the quality control tests of ^{99m}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 ^{99m}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 ^{99m}Tc-Br-IDA and ^{99m}Tc-gluconate had investigated in mice .

CONTENTS

CHAPTER II

^{99}Mo-^{99m}Tc Gel Generator