SUMMARY

Technetium is the most widely used radionuclide in diagnostic nuclear medicine due to its nearly ideal physical and nuclear properties as well as its ready availability.

It is well known that ^{99m}Tc-diphosphonate (especially ^{99m}Tc-methylene diphosphonate and ^{99m}Tc-1-hydroxyethyledene diphosphonate) complexes are widely used as radiopharmaceuticals for bone imaging, but the search for alternative bone-seeking radio labelled complexes continues. It is noteworthy that, the phosphonate compounds are very expensive and are not commercially available, so such compounds must be locally synthesized. Radiopharmaceuticals for cancer radiotherapy have been recently considered with keen interest.

It is noteworthy that this thesis entitled

" SYNTHESIS AND LABELING OF SOME ORGANIC COMPOUNDS WITH TECHNETIUM-99m AS ONE OF THE MOST RADIOACTIVE ISOTOPES " , comprises three chapters:

Chapter 1

(General Introduction), comprises the introduction which presents brief accounts on the importance of radioactivity in nuclear medicine, radionuclides used for radiodiagnosis, chemistry and radiochemistry of technetium, production and separation of ^{99m}Tc, radiolabelling and methods of radiolabelling with ^{99m}Tc and ^{99m}Tc--radiopharmaceuticals. Freeze drying, kit preparation and finally quality control tests of the radiopharmaceuticals.

Chapter 2

(Synthesis of Some phosphonate derivatives)

Includes a brief introduction (including: the importance of the phosphonate compounds in nuclear medicine and a concise literature survey reported on synthesis of some phosphonate derivatives), the used chemicals and equipment, and the experimental procedures used for preparation and purification of 1-Mercaptoethylidene-1,1-diphosphonic acid (MEDPA) and its disodium salt (MEDP), preparation and purification of 1-Hydroxyprpoylidene-1,1-diphosphonic acid (HPDPA) and its disodium salt (HPDP). It is noteworthy that HEDP and MEDP were prepared by using PCl_3 and H_3PO_3.

Furthermore, this chapter includes the results and discussion of synthesis of the target compounds. The percentage yields obtained for MEDPA and HPDPA were 85, 97 %, respectively (based on PCl_3 experiments). The identification of the prepared compounds, by using the elementary as well as spectroscopic (IR, ^{1}H-NMR,^{13}C-NMR, and ^{31}P-NMR) measurements, was discussed.

Chapter3

(^{99m}Tc-phosphonate complexes: preparation and biological distribution)

Contains a short introduction (including: using the ^{99m}Tc-phosphonate complexes for bone scintigraphy, a concise literature survey reported on radio labelling of some phosphonate derivatives with

^{99m}Tc), the used chemicals and equipment, along with the experimental procedures used for preparation of the required solutions. Different parameters affecting the labelling yield have been investigated which include phosphonate derivative content, Sn(II) content, pH and reaction time. Determination of the percent labelling yield by different techniques including; paper chromatographic (PC), thin layer chromatographic (TLC-SG), gel chromatographic column scanning (GCS) and gel chromatographic column elution (GCE) has been studied and discussed. High radiochemical yields (determined by using PC and TLC-SG techniques) have been achieved; ~ 85 and ~ 97 % for MEDP and HPDP, respectively. These high radiochemical yields were achieved at 5 mg MEDP, 0.1 mg Sn(II) content, pH 6.5-7, and temperature 22°C for MEDP, and at 10 mg HPDP content, 0.2 mg Sn(II) content, pH 6.5-7 and temperature 22°C for HPDP. Biological distributions of the prepared ^{99m}Tc-MEDP and ^{99m}Tc-HPDP complexes were studied in mice and the percentage of the injected doses in bone after 1 h were found to be more than 45 and 39.5 %, respectively.