

**^{99m}Tc-Labeled Monofluorophosphate as a Skeletal Imaging Agent:
a Comparison with Pyrophosphate and Diphosphonate**

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Fluoride ions, a trace amount of bone crystal, have been shown to have a strong affinity for the hydroxyapatite crystal of bone. A sodium monofluorophosphate stannous fluoride preparation was developed at the Radiochemical Center (Amersham, England). Combination of high affinity for bone of fluorine and phosphate with the convenience of ^{99m}Tc is attractive. We have compared its performance with those of ^{99m}Tc-pyrophosphate and ^{99m}Tc-diphosphonate in rabbits. Studies included chromatographic quality control, measurements of blood clearance, tissue distribution, urinary excretion, skeletal imaging and measurements of the serum calcium. The percentage labeling for ^{99m}Tc-monofluorophosphate was 98% on paperchromatography and 85% on thin layer chromatography. A large fraction of the activity of three labels cleared very rapidly from the bloodstream, however, slow components of the curves represented the highest level for ^{99m}Tc-monofluoro-

phosphate and lowest for ^{99m}Tc-diphosphonate. Three hours after injection 20.0% of the dose of ^{99m}Tc-monofluorophosphate was taken up by bone. The corresponding values with ^{99m}Tc-pyrophosphate and ^{99m}Tc-diphosphonate were 29.1% and 40.0% respectively. The concentration in the bone to that in other major organs was highest in ^{99m}Tc-diphosphonate. The ratios were comparable for both ^{99m}Tc-monofluorophosphate and ^{99m}Tc-pyrophosphate and much lower than those with ^{99m}Tc-diphosphonate. Visual comparison of the scans obtained with three labels confirmed the results of radioassay. All the labels were excellent skeletal imaging agents, however, ^{99m}Tc-diphosphonate appeared superior to other two labels, because the contrast between bone and background was better. With 50 mg of monofluorophosphate and 1 mg of stannous fluoride, no hypocalcemia was noted.