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Evaluation of Weight Influence on Tc-99m-MDP Biodistribution in Rats

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Chemical forms of ^{99m}Tc are present in the most widely used radionuclide imaging agents for brain, liver, lung and skeleton, and in thyroid scintigraphy. The technetium-99m-labelled methylene diphosphonic acid (^{99m}Tc -MDP) is used radiopharmaceutical for bone imaging procedures in Nuclear Medicine. For biological control of ^{99m}Tc -MDP, the United States Pharmacopeia (USP) recommends intravenously injection dose between 0.075 - 75 MBq (2 - 20 mCi), in a volume not exceeding 0.2 mL, into the caudal or external jugular vein of each of three 175 - 250 g rats. The objective of this work was to study the % injected dose (% ID) and retention dose (% RD) variation for femur, carcass, kidneys and liver in different weight animals including overweight rats and correlate the femur uptake level and the animal weight. The experiments were carried out in 4 groups of male Wistar rats ($n=24$): 130-175 g; 176-250 g, 251-325 g and 326-390 g. A dose of approximately 55.5 MBq (1500 μCi) in 0.1 mL was injected in the caudal vein of each animal. About 1 h after the injection, the rats were sacrificed and samples of liver, kidneys, muscle, femur, intestines and carcass were carefully removed. The organs were weighed, the radioactivity was measured in a well type detector gamma counter (counts per minute) and % ID and % RD in each organ were calculated. As well as the weight range, the USP establishes that not more than 5.0% of the total radioactivity must be found in the liver or in the kidneys, and not less than 1.0% of the total radioactivity is found in the femur, in not less than two of the animals. The results demonstrated that ^{99m}Tc -MDP uptake as % RD in femur and carcass decreased when the weight increased, mainly between 300 - 350 g. The radioactivity in the femur and the carcass linearly diminished with the corporal mass; above that there was a decrease of about 1% in 350 g weight animals. It was observed that the renal uptake increased in animals up to 250 g weight. There was practically no alteration in the liver uptake while intestine uptake had a slight increase in overweight animals. All the results were below the specified acceptable range. The results have shown that for an ideal experiment performance it is recommended using a definite weight range about 175-300 g for each animal.