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Fast Method for Determination of Minute ^{90}Sr Impurities in ^{90}Y Solution for Quality Control Purposes

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^{90}Y is a widely used radionuclide in therapeutical nuclear medicine applications. To be safely administered to patients, ^{90}Y solution must fulfill specific quality requirements; it must be at correct pH, endotoxin free, metal free, and it should have only minute amounts of long-lived parent nuclide ^{90}Sr. The aim of this work is to develop a fast, efficient and reliable method to determine ^{90}Sr content in ^{90}Y solution. The separation of ^{90}Y and ^{90}Sr is performed by using highly selective extractive chromatographic Sr Resin. ^{90}Y sample is loaded to the column in diluted nitric acid. Yttrium under this condition does not retain on the column so it is first washed out and collected. Yttrium fraction is measured with a dose calibrator. Strontium is eluted from the column with water. The strontium fraction is evaporated to near dryness and dissolved in scintillation cocktail. Finally the sample is measured with liquid scintillation counting (LSC). The problem in using LSC in ^{90}Sr determination lies with the ingrowth of ^{90}Y in the sample. High energetic ^{90}Y spectrum (max. 2250 keV) overlaps ^{90}Sr spectrum (max. 550 keV), hence obtaining a 'pure' ^{90}Sr spectrum is impossible. An indirect mathematical model that utilizes counts of the beta spectra originating from each nuclide is a convenient method for subtracting ^{90}Y from the ^{90}Sr–^{90}Y spectrum. A pure ^{90}Y spectrum is measured and a window in the high energy area of the spectrum is selected. The window area is normalized with the yttrium-90 counts in the ^{90}Sr–^{90}Y spectrum. The two spectra are subtracted from each other resulting in a pure ^{90}Sr spectrum. The developed method allows a rapid ^{90}Sr content determination with $^{90}Sr/^{90}Y$ ratio as low as 10^{-8}. The time needed for the entire quality control procedure is in the range of one hour. Same mathematical method can be used to determine tungsten-188 content in rhenium-188 solution from $^{188}W/^{188}Re$ - generator.

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Glomerular Filtration Rate (GFR) (51Cr-EDTA) in Paediatric Oncology

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The dosing of carboplatino used in Neuroblastoma's treatment, must be based on the renal function determined by GFR in all the patients with a target value of Area under the curve (AUC) of 4.1 mg/ml.min/day. High doses of Ifofosmamide used in Rhabdomiosarcoma and Ewing's Sarcoma treatment produce renal damage. **Aim**: To asses the usefulness of GFR's calculation for the dosing of chemotherapy in bone marrow pre-transplant of Neuroblastoma and its nefrotoxicity in Ewing's Sarcoma and Rhabdomiosarcoma. **Material and methods**: A total of 37 patients have been studied distributed in three groups: Group I: 10 patients ranging in age 2 to 13 years diagnosed of Neuroblastoma. The Carboplatino doses were calculated, in Hemato-oncology department. It was obtained by half life of elimination of ^{51}Cr-EDTA (t ½) and the body weight (B.W.) of the patient, by means of the Newell's formula. Group II: 10 patients ranging in age 3 to 15 years diagnosed of Rhabdomiosarcoma treated with Ifosfamide's high doses. Group III: 10 patients ranging in age 2 to 23 years diagnosed of Ewing's Sarcoma, treated with Ifosfamide's high doses. **Results**: The average values were: Group I: B.W.: 19.41 kg. GFR: 49.31±24.48 ml/min Normalized GFR (GFRN): 143.6 ± 73.14 ml/min. t½: 87.8±23.9 min Group II: GFR: 62.83±39.21 ml/min, GFRN: 116±35.08 ml/min, B.W..:30.8 kg Group III: GFR: 66.7± 38.9 ml/min, GFRN: 94.8± 36.5 ml/min. B.W..: 43.29 kg. **Conclusion**: The ^{51}Cr-EDTA method can determine the right dose of Carboplatino in order to reach an AUC of 4.1 mg/ml.min/day by the body weight and the value of the half-life of elimination of ^{51}Cr-EDTA. This dose limits the variation of predictable values of AUC based on the guideline of traditional dosing. The calculation of the GFR with ^{51}Cr-EDTA seems to be very useful in the follow-up of the renal function after the administration of high doses of Ifosfamide.

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Isotopic blood volume: interest of ^{125}I-human serum albumin in determination of plasma volume.

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Aim: Because of viral risk, the aim of the study was to investigate the possibility of cancelling ^{125}I-human serum albumin (^{125}I-HAS) to measure plasma volume and only calculate it from red cell mass measurement by ^{51}Cr. **Materials and methods**: Comparison of plasma volume measurement by ^{125}I method (VP exp) and by calculation (VP calc) by a retrospective review performed with patients from 2000 to 2005. This consisted of two series: males (254) and females (111). Only the patients with normal globular volume (VG) and VP (VG exp<25% VG theoretical; VP exp<25% VP theoretical) have been studied. Calculation formulas were: VG(HtS/(1-HtS)) for VP calc, 1,06 * age + 822 x body surface (BS) for female VG th, 1485 * BS - 825 for male VG th, 1395 * BS for female VP th, 1578 * BS for male VP th. Data were analyzed for means. A Student test and regression analysis were performed using the excel program of MicroSoft, Inc. **Results**: The student test has shown that it existed a significant difference between VP exp and VP calc for males ($p<0.05$) and females ($p<0.05$). However, the regression analysis has shown a correlation of VP exp versus VP calc for males ($r=0.919$ for 20 minutes blood sample) and females ($r=0.964$ for 20 minutes blood sample). When the equations of correlation lines have been used to find VP exp from VP calc on a 2006 patient's sample, a significant difference was remained between the two VP. **Discussion and conclusion**: According to these results, the use of ^{125}I-HAS seems to be indispensable to obtain a good estimation of VP. As it has been shown by Morin, et al. in 1972 (Ouest-Médical, 25è année n°10, 10 mai 1972), the use of HtS to calculate the VP calc. explains this result. HtS is obtained from the formula: venous Ht * X where X estimation is 0.91. In reality, X depends on the person. So to limit the viral risk linking to the use of ^{125}I-HAS, only red cell mass measurement by ^{51}Cr will be done in research of myeloproliferative syndrome (Vaquez disease,...) and ^{51}Cr and ^{125}I-HAS will be used in other cases. To optimize the choice of the technique (single or double isotopes), we are developing a prescription medium in order to obtain all necessary informations to choose the best technique.

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^{123}I-Iodide Radiopharmaceuticals, Comparison of Activity Measured Using Two Dose Calibrators.

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Aim Activity measurement of ^{123}I radiopharmaceuticals, may be affected by several factors such as recipient shape and its nature (kind of glass, plastic, etc); as well as, the own attenuation produced by liquid volume in which radiopharmaceutical is dissolved. The aim of this study is the assessment of variation between measured activity and reference activity, using two different dose calibrators. As well as, the calculation of corresponding correction factors necessary to obtain the most exactly dose with each dose calibrator. **Material and methods** We have used two dose calibrator for activity measurement: Capintec CRC®-15R (DC1) and Capintec CRC®-12 (DC2). Activity measurement of ^{123}I was performed using the corresponding channel of each dose calibrator. 35 measurements of ^{123}I activity were performed to the radiopharmaceuticals into manufacturer vial, and others 35 after withdraw the whole radiopharmaceutical activity into a 5 mL syringe. Those measurements were performed in both dose calibrators. The measured activity in each case was compared with reference activity. Also, we have calculated the medium variation percentage (MVP) of measurements performed versus reference activity, as well as, the medium correction factor (MCF) for each measurement. **Results** The MVP of measurements performed versus reference activity in case of DC1 was 12.63 ± 5.70 in syringe and in manufacturer vial -29.29 ± 1.82. In case of DC2 MVP in syringe was 29.67 ± 6.36 and in manufacturer vial -22.57 ± 0.08. MCF were calculated in each case. For DC1: syringe, 0.89 ± 0.05; manufacturer vial, 1.42 ± 0.04; and for DC2: syringe, 0.77 ± 0.04 and manufacturer vial, -22.57 ± 8.08. **Conclusions** Our results showed than measured activity for ^{123}I using manufacturer vial was significantly lower than reference activity, in both dose calibrators; while, on the contrary, when the radiopharmaceuticals was measured in syringe, the activity resulted higher than reference activity, and moreover, higher in case of DC2. In consequence, to get the most exact activity measurement of ^{123}I radiopharmaceuticals, it is necessary the calculation and use of the correction factor corresponding to the dose calibrate used to the measurement, both for manufacturer vial activity and syringe activity.

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Pharmacokinetic study of the radiopharmaceutical ^{99m}Tc-dextran-70 in rats

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Introduction: Dextrans are glucose polymers, whose versatility has led to their application in numerous fields. ^{99m}Tc-labelled dextrans have been proposed as possible substitutes for human albumin and labelled red blood cells in angiography and cardiac pool studies. **Objective:** To assess the pharmacokinetics of a ^{99m}Tc-labelled dextran-70 preparation in rats. **Material and Methods:** Eight Wistar male rats with an average weight of 250g were administered with 18 MBq of ^{99m}Tc-dextran-70 in a volume of 300 µl *via* cannula in jugular vein. Blood samples of 1 ml were taken at 10, 30, 60, 180, 360 and 480 min post-injection and kept in a flask with anti-coagulant; 0.5 ml of each sample was centrifuged to obtain plasma. Aliquots of 0.2 ml of total blood and plasma were measured in a well counter for 5 minutes. The activity of each sample was determined as a function of time and the following pharmacokinetic parameters were determined: plasma concentration, apparent distribution volume and plasma clearance of the radiopharmaceutical. **Results:**

INITIAL PLASMA CONCENTRATION	318.57 kBq/ml
DISTRIBUTION VOLUME	67.42 ml
T1/2	52.08 min
PLASMA CLEARANCE	0.89 ml/min

Discussion: At 30 min of the administration of the radiopharmaceutical, 62.5% of the dose remained in the plasma compartment, with a $T_{1/2}$ of 52.08 min. At 6 hrs, more than 80% of the radiopharmaceutical had cleared. These data are comparable with reports in the literature for preparations with dextrans of similar molecular weights. ^{99m}Tc-labelled dextran-70 shows the characteristic kinetics of a vascular tracer.

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Comparison of In vivo / in vivo-in vitro methods of Red blood cells labelled with ^{99m}Tc.

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Aim Autologous red blood cells labelled with ^{99m}Tc (^{99m}Tc-RBCs) is the radiopharmaceutical of choice for evaluation of left ventricular ejection fraction (LVEF). There are three different methods for the preparation of ^{99m}Tc-RBCs: *in vitro*, *in vivo* and *in vivo/in vitro*. The aim of this study is the comparison of labelling efficiency (LE) of ^{99m}Tc-RBCs between *in vivo* and *in vivo-in vitro* methods. **Material and methods** We have performed 81 evaluations of LVEF, 39 evaluations were performed following *in vivo* method and 42 evaluations were performed following *in vivo/in vitro* method. In every case LE was tested: *In vivo/in vitro* method: 0.05-0.10mL ^{99m}Tc-RBC aliquots were added to 2mL of NaCl 0.9% solution into sterile vacuum blood collection tubes. The tubes were centrifugated at 1300x*g* for 3 minutes and supernatant (cell-free plasma) was transferred into plastic test tubes. LE was calculated by measurement, both cell-free plasma and RBCs packed, activities using a dose calibrator (Capintec CRC®-15R). *In vivo* method: 4mL whole-blood was withdrawn from a peripheral vein using a 5 mL heparinnized syringe. It was centrifuged at 1300x*g* for 5 min and supernatant was transferred into plastic test tubes. LE was calculated by measurement, both cell-free plasma and RBCs packed, activities