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PRODUCTION OF Zn-62 AND DEVELOPMENT OF Zn-62/Cu-62 GENERATOR SYSTEM. N. Ueda, S. Nakamoto, Y. Tanaka, M. Hazue, *Y. Fujibayashi and *A. Yokoyama. Research & Development, Technical Department, NIHON MEDI-PHYSICS CO., LTD., Takarazuka.
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Zinc-62(9.13 hr) and its daughter, Cu-62 (9.73 min), are suitable isotopes for medical and biological uses. Zinc-62 was obtained by Cu-63(p,2n) reaction. The yield, calculated at EOB, of Zn-62 produced by bombardment of natural copper (% abundance, Cu-63: 69.09%, Cu-65: 30.91%) with 26 MeV protons was in the range of 2.3 - 3.2 mCi/μA-hr. The amount of nuclidic impurity, Zn-65, produced by Cu-65(p,n) reaction, was about 0.15%. Separation of carrier free Zn-62 from irradiated copper target was performed by using anion exchange resin.

Zinc-62/copper-62 generator was prepared. The parent nuclide, Zn-62, was adsorbed on cation exchange resin, and the daughter nuclide, Cu-62, which is an almost pure positron emitter, was eluted with sodium thiosulfate solution (pH 6.8). The elution efficiency of Cu-62 was dependent on the concentration of sodium thiosulfate solution, and in the range of 10 - 50mM concentration of sodium thiosulfate, about 70% of the available Cu-62 was obtained in a 5ml volume. The breakthrough of Zn-62 was not detected even after the elution of 200 ml of 50 mM sodium thiosulfate.

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Zn-62 RADIOPHARMACEUTICAL FOR PANCREATIC DIAGNOSIS (5) Zn-62—Cu-62 RADIOACTIVE EQUILIBRIUM EFFECT ON BIODISTRIBUTION OF Zn-62. Y.Fujibayashi, I.Yomoda, A.Yokoyama, H.Tanaka, K.Horiuchi, H.Saji, R.Morita, K.Torizuka. Kyoto Univ. Faculty of pharm.Sci. & School of Med.

In previous work, the plausible use of Zn-65 radionuclide and its Zn-EDDA(ethylenediamine-N,N'-diacetic acid) chelate for functional diagnosis of the pancreas has been reported. Availability of the short-lived, cyclotron produced Zn-62, a positron emitting radionuclide offers greater clinical applicability, however, due to its equilibrium with daughter Cu-62, a study of its effect is estimated as necessary. In this work, the mice biodistribution of Zn-65 was entirely different from that of Cu-64. The carrier free Zn-62(Cu-62) produced lower pancreas and liver uptake than Zn-65. Nevertheless, Zn-62(Cu-62) in the presence of carrier(Zn added) registered similar biodistribution pattern to Zn-65, but different from Cu-64. Administration of Zn-62(Cu-62) as EDDA chelate in the presence of carrier showed high pancreas to liver ratio but lower as compared to a similar experiment performed with Zn-65. Since at the Zn-62 and Cu-62 equilibrium, half of the radioactivity arised from Cu-62, its effect in the decrement can not be neglected. But, in vivo biodistribution studies of Zn-62(Cu-62) registered sililar pattern to Zn alone, different from Cu. Thus, Zn-62, namely as Zn-EDDA chelate offered great potential as Zn containing radiopharmaceutical to be used in the diagnosis of pancreas pathology.

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DEVELOPMENT OF RADIOPHARMACEUTICALS FOR THROMBUS DETECTION (III): BASIC STUDIES ON THROMBUS IMAGING WITH Ga-67 LABELED UROKINASE. Y.OHMOMO, A.YOKOYAMA, Y.YAMAUCHI. Dept. of Radiopharmaceutical Chemistry, Faculty of Pharmaceutical Sciences, Kyoto University. K.YAMAMOTO, K.HORIUCHI, H.SAJI, Y.ISHII, and K.TORIZUKA. Dept. of Nuclear Medicine, School of Medicine, Kyoto University, Kyoto, JAPAN.

Highly purified urokinase, currently in use for the treatment of thrombosis, was labeled with Ga-67 using deferoxamine as a bifunctional chelating agent. Ga-67 labeled urokinase showed a slightly higher enzymatic activity of 110% compared to that of non-labeled parent urokinase and its labeling efficiency was 91.7%. Studies on the in vivo behavior of Ga-67 labeled urokinase in white rabbits showed a very rapid blood clearance with a half-life of 4-8 min at its first phase due to complex formation with plasma protein inhibitors of different molecular weights one of more than 200,000 and the other of about 120,000. High liver and kidney uptake of Ga-67 labeled urokinase was observed through biodistribution studies in mice. Studies carried out in rabbits with induced thrombi in the femoral vein showed thrombus-to-blood Ga-67 urokinase activity ratios of 2.0-3.1 with thrombi aged 4 hr to 3 days within 2 hr after injection; little incorporation of Ga-67 labeled urokinase by the thrombi was detected, lower than 0.01% of injected dose per gram of thrombi.

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Ga-67 BINDING SUBSTANCES IN KIDNEY, HEART, SPLEEN AND LUNG. I.Ando, A.Ando, T.Hiraki and H.Hisada. Kanazawa University. Kanazawa.

We already reported that Ga-67 was bound to acid mucopolysaccharides(heparan sulfate , etc.) in tumor and liver. This work was undertaken to determine Ga-67 binding substances in kidney, heart, spleen and lung.

Ga-67 citrate and sodium sulfate-S-35 were injected to the rats, respectively. The above four organs were excised 24 hours after administration. These organs were homogenated. After removal of nuclear fraction by centrifugation, the homogenates were incubated with proteinase(Pronase P) for 48 hours at 37°C. After digestion, supernatants of this reaction mixtures were applied to Sephadex G-100 columns. The resultant eluates were analyzed for radioactivity of Ga-67 and S-35, protein and acid mucoplysaccharides. Three peaks of Ga-67 and S-35 were obtained by gel filtration. The first peak eluted in the void volume contained a species whose molecular weight exceeded 40000. The second peak consisted of substances with molecular weight of 9400-40000. Radioactivity in the third peak was from sodium sulfate-S-35 and unbound Ga-67. The three peaks of Ga-67 was identical with the peaks of S-35, respectively.

From the results of this experiment, it was clarified that Ga-67 was bound to acid mucopolysaccharides(heparan sulfate, etc.) in the above four orans.