Estimation of Whole Body Absorbed Dose of the Patient Administered ^{57}Co-Bleomycin for Tumor Diagnosis

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^{57}Co-Bleomycin is an anticancer agent which has recently been put into clinical use for tumor diagnosis. Intravenous administration of 0.5 mCi of ^{57}Co-Bleomycin was reported to yield an effective scanning image of tumor tissue, especially in case of lung cancer. The authors attempted to evaluate the whole body absorbed dose, being based on the excretion data actually obtained for the patients submitted to the clinical diagnosis.

The average whole body absorbed dose D (rads) delivered by q mCi of ^{57}Co-Bleomycin can be calculated by the following formulua;

$$D=q(\mathrm{mCI})\times 3.7\times 10^{7}(\mathrm{dps/mCi})\times 60^{2}(\mathrm{sec/h})\times 24(\mathrm{h/day})\times \varepsilon(\mathrm{Mev/decay})\times 1.602\times 10^{-6}(\mathrm{erg/MeV})\times \int_{0}^{\infty}\left\{f_1\exp\left(-\frac{0.693}{T_1}t\right)+f_2\exp\left(-\frac{0.693}{T_2}t\right)\right\} dt/W(\mathrm{g})\times 100(\mathrm{erg/g\ rad})$$

$$=7.39\times 10^{4}(f_1T_1+f_2T_2)\frac{q\times\varepsilon}{W}\quad(\mathrm{rads})$$

where

ε : effective energy absorbed in the whole body per disintegration of ^{57}Co (MeV/decay)

W : mass of the body (g)

f_1, f_2 : fractions in the rapid and slow phases respectively

T_1, T_2 : effective half-lives in the rapid and slow phases.

Substituting 70kg for W, the whole body absorbed dose delivered by the administration of 1 mCi of ^{57}Co-Bleomycin becomes 750 mrads.

Experimental Studies on the Distribution and Excretion of ^{169}Yb citrate

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Since Hisada et al (1972) used ^{169}Yb-citrate for the diagnosis of malignant tumor, many replications have been peformed concerning it. The authors, who had carried out experimental

studies both in vivo and in vitro on incorporation of various metals by cancer cells, compared their results with those from ^{169}Yb-citrate.

Isotopes to be tested were s.c. or i.p. injected at certain intervals to ddN mice, which preliminary received s.c. or i.p. transplantation of Ehrlich's ascites tumor cells, and uptake of the isotopes by these cells were comparativey investigated. Besides ^{169}Yb, were used ^{54}Mn, ^{59}Fe, ^{60}Co, ^{65}Zn, ^{86}Rb, ^{115m}Cd (all these as chloride), ^{67}Ga citrate and ^{203}Hg (as various compound).

Results: Ehrlich's tumor cells were i.p. or s.c. transplanted, and ^{169}Yb was given i.p. or s.c. at 4 days or 12 days thereafter, and the uptake of the isotope by the tumor cells and other organs were investigated after intervals of 3 days and more, to be compared with uptakes of other metal muclides, In all the cases, ^{169}Yb was most abundantly incoporated in bone, followed by the kidney (or liver); about next in order came the tumor. The uptake of this grade can not be said especially satisfactory in comparison with uptakes of other nucleides (^{65}Zn, ^{54}Mn, etc).

^{169}Yb has raised a problem concerning its irradiation dose because of its retention in bone. It is therefore necessary to take adequate countermeasure after its application. The authors attempted removal experiments with mice, using various chelating agents, and found that DTPA was most effective, followed by EDTA.

On the basis of the above results, the author criticized the socalled cancer-affinity, and brought out a question for the future study on this point.

Affinity for a Malignant Tumor and Bone of Thulium-167

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The higher atomic number rare earth radionuclides have been reported to concentrated in nonosseous tumor tissues (Hisada, K. and Ando, A., J. Nucl. Med. **14** 615, 1973). In various rare earth radionuclides, thulium (Tm-170) showed the highest relative uptake in Yoshida sarcoma. In radioisotopes of thulium-170, thulium-167 has excellent physical properties in its γ-ray energy (208 keV) and its physical half life (9.6 days) for clinical use.

The method of manufacturing thulium-167 with linear accelerator has been investigated by us. Some thulium-167 was recently produced by this method (this method was reported by coworker in the section of radiopharmaceuticals in this meeting.). ^{167}Tm (carrier free and containing stable thulium 5 μg and 50 μg) were administered to rats (both Yoshida sarcoma-bearing rats and rats with fractured tibia) by tail vein in the citrate form, respectively. And these rats were sacrificed at 3, 24 and 48 hours after injections of each perparation. The radioactivities of tumor, blood, muscle, liver, kidney, bone and callus were measured by a well-type scintillation counter, and retention values in every tissue including tumor were calculated (in per cent of administered dose per g·tissue weight). From these values, the values of