Tumor scanning with $^{57}$Co- Bleomycin

T. MAEDA
Kyushu National Cancer Center Hospital, Fukuoka
A. KONO and M. KOJIMA
Faculty of Pharmaceutical Science, Kyushu University, Fukuoka

Bleomycin-$^{57}$Co (BLM-$^{57}$Co) was concentrated in the Ehrlich solid tumor in the mice. Twenty-four hours after the injection, high radioactivity was found in the tumor tissues as well as in the liver and kidney.

One hour after the injection, BLM-$^{57}$Co was detected in the tumor tissue homogenate and in the urine by thin layer chromatography. All the radioactivity in the urine was attributable to BLM-$^{57}$Co. These indicate that BLM-$^{57}$Co is fairly stable in a mammalian body.

We also prepared BLM-$^{67}$Ga and compared with BLM-$^{57}$Co or $^{67}$Ga-citrate. The distribution patterns of BLM-$^{67}$Ga were almost the same as those of Ga-citrate in mice. BLM-$^{67}$Ga was unstable in a mammalian body. In these three compounds, BLM-$^{57}$Co was concluded to be the best tumor localizing agent.

When BLM-$^{57}$Co or BLM-$^{14}$C-Co was used, the radioactivity ratio of nuclear to subcellular fraction in the tumor tissue homogenate was about 7:3; the same as the total DNA ratio of each fraction.

On the contrary, in case of BLM-$^{14}$C the ratio was 3:7. This suggests that the DNA binding nature of BLM is altered by the chelation with Co (II). DNA of the tumor was purified. 30–40% of the radioactivity were lost in the course of the purification of BLM-$^{57}$Co bound as well as BLM-$^{14}$C-Co bound DNA. Dialysis and gelfiltration of the purified DNA showed that BLM binds firmly to DNA, and the isolation of cobaltous ion from the DNA-BLM-Co was 10–20%.

Clinical study on the use of $^{57}$Co-Bleomycin for the diagnosis of malignant tumor.

The preparation of $^{57}$Co-BLM was as follows: Solution of carrier free $^{57}$CoCl$_2$ was added to aqueous solution of Bleomycin, and the PH of this mixture was adjusted to PH 6–7, 320–500 uCi (Bleomycin: 5 mg) was administered to the patient intravenously. Six hours and 24 hours after administration, scintigraphy was taken with scintcamera and scintiscanner ($5^\circ \phi \times 2^\circ$).

$^{57}$Co-Bleomycin was administered to 22 patients with tumors which was diagnosed as malignant clinically. Similarly $^{57}$Co-Bleomycin was administered to 2 patients in whom the presence of malignant tumor was suspected but subsequently were found to have other disorders operatively (One patients was aneurysma of pulmonary artery, and other was pneumonia). Twenty lesions in the 30 lesions of 22 patients were recognized as positive images in scintographies obviously.

A female, 20-year-old, was admitted with a radiographically confirmed diagnosis of gastric cancer, vertebra metastasis and pulmonary lymphangitic metastasis. The scintigram with $^{57}$Co-Bleomycin showed the lesion of vertebra, patchy pattern of lung lesions and further the iliac bone lesion, while the X-ray film at the same time was not showed the iliac bone metastasis. Subsequently the iliac bone metastasis was recognized on the X-ray film 2.5 months after the scintigraphycal examination. This case emphasizes the diagnostic significance of tumor scanning with $^{57}$Co-Bleomycin.

On the other hand, the non-malignant lesions of 2 patients was not recognized scintigraphycally. The excretion ratio of $^{57}$Co in the urine was about 85% in 24 hours after i.v. injection. Absorbed doses of total body and kidney were estimated about 20 mrad and 2 rads per 1 mCi of $^{57}$Co-Bleomycin.