

## **Radionuclide Therapy using Re-188**

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Re-188 is of current interest for the variety of therapeutic applications. Re-188 has several advantages compared to other beta-emitting radionuclides. It emits beta particles with an average energy of 764 keV and a 155 keV gamma ray, which are suitable for therapy and imaging. Chemical properties of technetium and rhenium are quite similar, and chemical techniques which have been developed for Tc-99m ligands can be applied for Re-188 ligands. Easy availability and low cost are the most important merits of Re-188 due to the development of W-188/Re-188 generator.

We developed a lipiodol solution of Re-188-hexadecyl-tetramethyl-diaza-decanedithiol (HTDD) and used for targeting liver cancer. The lipiodol solution of Re-188 HTDD was well-retained in the lipiodol phase in vitro, and highly accumulated in hepatoma after injection through the hepatic arteries in rat model. Right now, this agent has been used in the multicenter trial of IAEA. Ionizing radiation holds great promise as a simple and potentially inexpensive method for the inhibition of the hyperplastic responses following percutaneous coronary balloon angioplasty. We performed randomized intracoronary radiation therapy using Re-188 liquid ballooning system in patients with symptomatic angina pectoris. This intracoronary radiation therapy decreased restenosis rate in all kind of intervened lesion with 57% of overall reduction rate, and especially reduced restenosis rate of restenotic lesion by 90%. We have used Re-188 tin colloid for the radiation synovectomy. The overall response rate was 85% in the preliminary clinical study of 18 patients with steroid non-responsive rheumatoid arthritis. We also developed Re-188 hydroxyethylidene diphosphonate (HEDP) for palliative therapy of bone metastases. Biodistribution study in mice and rats showed high accumulation of this compound in metastatic bone and bone marrow. Gamma camera images of Re-188 HEDP were quite similar to those of Tc-99m MDP images. In addition, we developed Re-188 labeled patch for the treatment of skin cancer.

However, there is still a need to develop new Re-188 labeled radiopharmaceuticals that are more specific for target lesions such as cancer specific monoclonal antibodies and peptides. It is believed that Re-188 generator system will bring about a renaissance in radionuclide therapy, in a way similar to that of Tc-99m generator and nuclear imaging.