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## INVITED LECTURE - A Bridge not too Far: Personalized Medicine with the use of Theragnostic Radiopharmaceuticals

*Monday 17 September 2012 10:30 (30 minutes)*

A major advantage of radionuclides is that they emit radiation of different radiobiological effectiveness and range of action. This offers the possibility of choosing a nuclide the physical and nuclear characteristics of which are matched with a particular tumor type, or the disease under treatment. This presentation introduces a relatively novel paradigm that involves specific individual radionuclides or radionuclide pairs that have emissions that allow pre-therapy low-dose imaging plus higher-dose therapy in the same patient. We have made an attempt to sort out and organize a number of such dual-purpose theragnostic radionuclides and radionuclide pairs that offer this exciting potential of low-dose imaging followed by higher-dose treatment and thus possibly bringing us a major step closer to personalized medicine. This approach would empower the age-long dream of performing individualized or tailored radionuclide therapy in cancer patients, as well as in the treatment of many other disorders that respond to radionuclide therapy. However, an increased and reliable availability of theragnostic radionuclides remains a major issue, which must be addressed before we can successfully put this paradigm into routine clinical practice. A low-dose administration using radiopharmaceuticals based on these theragnostic radionuclides or radionuclide pairs would initially allow molecular imaging (SPECT/CT or PET/CT) to provide the necessary pre-therapy information on biodistribution, dosimetry, the limiting or critical organ or tissue, and the maximum tolerated dose (MTD), etc. If the imaging results then warrant it, it would be safe and appropriate to follow up with dose ranging experiments to allow higher-dose targeted molecular therapy with the greatest effectiveness. It is worth emphasizing that our nuclear medicine modality is the only modality that can fulfill the dream of carrying out tailored personalized medicine by way of enabling diagnosis followed by therapy in the same patient with the same radiopharmaceutical. At BNL, our work on radionuclide therapy has for some time focused on the development of this paradigm for application to several distinct clinical areas, e.g., palliation of bone pain from osseous metastases, treatment of metastatic bone disease, radiation synovectomy, radioimmunotherapy, and cardiovascular applications. This presentation will include the discussion of a number of individual radionuclides and radionuclide pairs which would be potentially excellent choices for theragnostic applications. Since the overall story (including preliminary clinical trials) is a bit more complete in the case of tin-117m, a conversion electron emitter with great theragnostic potential, it will be discussed in more detail, as an example.

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