Radiopharmaceuticals: Cancer Therapy

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AIM

The aim of this is paper is to make aware the reader about the technologies that exists that make the treatment of certain diseases such as cancer to be more efficient by the use of different approaches. In this particular case, we'll look into the dealings in regards to the radioactive substances and the science behind them that is being applied to treat diseases such as cancer. Radiopharmaceuticals, or medicinal radio compounds, are a group of pharmaceutical drugs containing radioactive isotopes. Radiopharmaceuticals can be used as diagnostic and therapeutic agents. Radiopharmaceuticals emit radiation themselves, which is different from contrast media which absorb or alter external electromagnetism or ultrasound. Radiopharmacology is the branch of pharmacology that specializes in these agents. The main group of these compounds are the radiotracers used to diagnose dysfunction in body tissues. While not all medical isotopes are radioactive, radiopharmaceuticals are the oldest and still most common such drugs. Radiation therapy was first used to treat cancer more than 100 years ago. About half of all cancer patients still receive it at some point during their treatment. And until recently, most radiation therapy was given much as it was 100 years ago, by delivering beams of radiation from outside the body to kill tumors inside the body.

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In principle, RPT may be applied to any cancer that satisfies the targeting criteria needed for delivery of radionuclides. However, RPT has been investigated for only selected cancers. The type of cancer investigated reflects developments related to the available targets, the availability of RPT agents against the targets, and the expertise and clinical investigators at academic institutions. RPT has had the greatest historical impact for thyroid malignancies and this persists to the present day. Haematological malignancies were investigated starting in the early 1990s and continue to be a subject of interest. RPT for hepatic malignancies and prostate cancer has seen the greatest increase since the 1980s.

This increase is consistent with the development of new RPT agents, 90Y- loaded microspheres and β- emitter- labelled and α- emitter- labelled small- molecule prostate-specific membrane antigen (PSMA)- targeting constructs, respectively (see later). The FDA- approved α- emitter 223Ra has also driven the substantial increase in interest in RPT for prostate cancer. Other solid cancers such as colorectal and breast cancer continue to be of interest but have not had the breakthrough construct development that has driven interest in RPT in hepatic and prostate cancer. Neuroendocrine and

somatostatin receptor cancers have been an ongoing subject of investigation, and the RPT agents targeting these cancers have probably reached maturity with the FDA approval. A number of RPT agents are currently on the market, with many more in development. These include four β- particle and five α- particle emitters. Lead-212 decays to bismuth-212 and is used as a means to deliver 212Bi, an α- emitter, without being constrained by its 1- hour half- life. Of the 30 RPT agents deliver radionuclides that decay by α- particle emission. The interest in α- emitters reflects a potential growth area in RPT.