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Occurrence of Radionuclides and Radionuclide Therapy

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Radionuclides

Radioactive forms of elements are called radionuclide. Some occur naturally within the environment, while others are man-made, either deliberately or as byproducts of nuclear reactions. Every radionuclide emits radiation at its own specific rate, which is measured in terms of half-life. Radioactive half-life is that the time required for half the radioactive atoms present to decay.

Radionuclides Occurrence in Groundwater

Radionuclides occur naturally in many rocks and minerals. Some radionuclides in rocks, like uranium, are present since the world formed. Others, like radon and radium, are the merchandise of the decay of these original radionuclides. As a result, these radionuclides frequently occur in groundwater.

Uranium-238 may be a common chemical element in many rock types. Uranium is merely weakly carcinogenic, but is toxic and causes kidney damage at elevated concentrations when consumed in drinking water. Because uranium is very soluble in its oxidized forms but only slightly soluble in its reduced forms, its concentrations in groundwater depend upon redox conditions, also as on pH and on concentrations of bicarbonate.

Radon-222 may be a daughter product of the decay of uranium. Radon may be a dissolved gas that dissolves easily in water, and is present in most groundwater within the US. When water that contains radon is employed during a home, most of the radon is released from the water into the air and may be inhaled. Inhalation of radon poses a risk of carcinoma.

Radium-226 and radium-228 are the 2 commonest isotopes of radium and both are daughter products of the decay of uranium. Both isotopes are carcinogenic. Radium dissolved in drinking water may be a human-health concern because it accumulates in bone and other tissues, increasing lifetime cancer risks.

Other radionuclides are produced from human activities, like nuclear weapons testing, nuclear facility releases, and radioactive waste.

Radionuclide Therapy

Nuclear medicine therapy uses radiopharmaceuticals targeting specific tumours, like thyroid, lymphomas or bone metastases, delivering radiation to tumorous lesions as a part of a therapeutic strategy to cure, mitigate or control the disease. It is often used either on selective targets or throughout the whole body.

Targeting the tumour

The treatment of cancer involves different strategies, like chemotherapy, surgery, radiotherapy and, last, targeted therapies, like the utilization of radionuclide-based therapies employed in medicine. Another treatment option available surely sorts of cancer is that the use of targeted radionuclide therapy, which is predicated on administering radioactive substances to patients. Like chemotherapy, this therapy may be a systemic treatment, reaching cells throughout the body by travelling through the bloodstream. However, unlike chemotherapy, these radioactive substances specifically target diseased cells, thus reducing potential side effects.

Radiopharmaceuticals

The radiopharmaceuticals can transport targeted doses of radiation on to the tumours and its metastases, thereby sparing normal healthy tissue. The selection of the molecule that carries the radiation to the tumour is decided by its affinity or binding power to the tumour's target structures, like antigens or receptors. The radiation emitted by radionuclides linked to the carrier kill cancer cells by damaging their DNA, causing the tumours to shrink.