

Term Paper Update-6

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1 Radionuclides in medicine

Radionuclides have many applications in several areas that use nuclear technology. The use of radiation and radionuclides in medicine is continuously increasing both for diagnosis and therapy worldwide.

In developed countries (1/4 of the world's population), one person in 50 is subject to nuclear medicine and the frequency of radionuclide therapy is about 10 percent of that number, according to the World Nuclear Association.

Radiation is used in nuclear medicine to obtain information about the organs of a person for treatment of a disease. In many cases, information is used for a quick diagnosis. Thyroid, bones, heart, liver, kidney and many other organs can be easily observed in the generated image and the anomalies of its functions are revealed. About 10,000 hospitals worldwide use radionuclides and about 90 percent of the procedures are for diagnosis. The radionuclide most used in diagnostics is ^{99m}Tc . It has been used in about 40 million exams per year, which means 80 percent of all exams in nuclear medicine worldwide.

Radionuclides are essential components of diagnostic exams. In combination with the equipment recording the images from the emitted gamma rays, the processes that occur in various parts of the body can be studied. For diagnosis, a dose of the radioactive material is given to the patient and the localization in the organ can be studied as a two-dimensional image or, using tomography, as a three-dimensional image. These gamma or positron tracers have short-lived isotopes and are linked to chemical compounds that allow specific physiological processes to be evaluated.

In the USA, more than 20 million medical applications per year are performed using radionuclides and in Europe about 10 million per year¹¹. In Brazil, the Nuclear and Energy Research Institute (IPEN) reported that, in 2017, there were 360 diagnostic clinics and nuclear medicine hospitals, 70 percent in the South and Southeast regions of Brazil, 72 PETs installed, others to be licensed, 33 hospitals with rooms for therapy and approximately 1.8 million patients per year.