EDITORIAL

Approaches in Nuclear Medicine and in Radiopharmacy

The utilization of radionuclides in Health Sciences has permitted the development of several useful procedures. These procedures have been associated with advances in research, as well as in the clinical approaches, allowing conditions to improve the diagnosis and therapy of diseases. The use of radionuclides, as “open sources”, has been successfuly utilized. Radiopharmacy and Nuclear Medicine are very closed specialities involved with techniques carried out with these sources. Radiopharmacy is a multidisciplinary field in which pharmaceutical chemistry, physics, physicians, biophysics, and biology are involved in the development of methods to otain radiolabeled molecular and cellular structures that play a pivotal role in the research and clinical nuclear medicine. When these structures are submitted to specific quality controls and can be used safely in human beings, they are known as radiopharmaceuticals or radiobiocomplex.

The clinical efficiency and efficacy of the radiopharmaceutical are determined by the different quality controls. A *radiobiocomplex* may be defined as a molecular or cellular structure containing a radioactive radionuclide. It is formulated with the aim to target various specific organs or tissues of the body. In general, the radiobiocomplexes available in nuclear medicine are mainly used for diagnostic purposes, but may also be used for therapeutic applications. An ideal radiopharmaceutical is one that rapidly and avidly localizes within the organ or tissue under investigation, remains in it for the duration of clinical evaluation, and is rapidly eliminated from the body. Nuclear medicine images permits the assessment of the organ function, the detection of disease and the monitoring of the effects of treatment. They are highly sensitive, specific and provide physiological information not available from other imaging modalities. The greatest potential of these nuclear medicine images is that they provide diagnostic information of pathological processes before the outset of structural changes. Moreover, these findings obtained using nuclear medicine techniques are more comprehensive because they demonstrate not only the organ structure but also its function. Consequently, these images are also known as metabolic ones.

Positron emission tomography (PET) is a powerful and worthwhile diagnostic procedure of the nuclear medicine that has had a major impact on the diagnosis and treatment of diseases. Because disease is a biological process, and PET is a metabolic imaging examination, PET can detect and stage most types of cancers, often before they are evident through other clinical procedures. PET can also give relevant early information about heart disease and many neurological disorders. Fluorodeoxyglucose-^{18}F (FDG) is the most common radiobiocomplex used in about 95% of the PET scan procedures. Single photon emission computed tomography (SPECT) is also a medical diagnostic imaging technique and it is similar to the PET. In the SPECT, different radionuclides are utilized, although the technetium-99m is the mostly

used. Moreover, the emission of a single (SPECT) instead of double (PET) photons is found. Furthermore, SPECT images have less sensitivity and are less detailed than PET images, but the SPECT technique is less expensive than PET. Moreover, SPECT is commonly found in the Nuclear Medicine Departments.

PET and SPECT images will permit that many diseases and cancers may be diagnosed much earlier due to an alteration of the pattern of the distribution of the radiopharmaceutical. However, other conditions besides the disease, as the drug interaction, could lead to poor images and to compromise the clinical evaluation and decision and/or the necessity of the repetition of the examination increasing the radiation dose for the patient.

Due to the high relevance of the radiopharmacy and of the nuclear medicine, approaches involving the radiation protection concepts, the quality management principles, the analysis of the images, the good manufacturing practices for radiobiocomplexes used in diagnosis and in therapy, the experimental models to try to evaluate the drug interaction must be considered and are welcome. Papers about these subjects are been published in this Suplement of the Brazilian Archives of Biology and Technology.

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