Improving radioprotection in a cyclotron & PET Center

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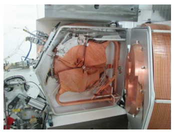
1.- Introduction

The Uruguayan Center of Molecular Imaging (CUDIM) started on May 2010 offering clinical examinations with PET/CT to all the Uruguayan population.
The main purposes of CUDIM are not only focused in diagnostic studies, but also in research, development of new clinical protocols and PET tracers and specialized training of human resources.

2.- Facilities

The facility includes a chemistry unit, a clinical department and a pre-clinical area allowing the development of new PET tracers from cells to human beings. To achieve our goals, we have the adequate equipment to synthetize a variety of different radiopharmaceuticals, performing high quality controls.
The area dedicated to radiopharmacy include a PET Trace Cyclotron (General Electric-GE), a 120 m^2 GMP area organized in laboratories for the production of ^{18}F (FDG and fluoride), ^{11}C (Methionine and Choline) and ^{68}Ga (DOTATATE and Gallgas).
The synthesis of radionuclides is performed in modules placed inside hot cells and shielded laminar flow hoods. The facility has rooms for animal facilities, cell culture and animal surgery and a trimodal camera PET / SPECT / CT (Triumph, GE) for small animals. The medical area has two PET/CT cameras (Discovery STE with 16 slices and Discovery 690 with 64 slices from GE) for image acquisition.



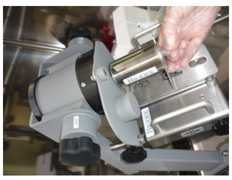
3.- Objective

The aim of this work was analize the impact of the improvement in radiation protection issues mainly for the exposed staff.

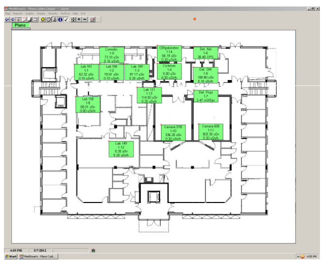
4.- Materials & Methods

The production of radionuclides and radiopharmaceuticals must fulfil radiation protection and pharmaceutical quality requirements. A centralized monitoring radiation system (Medismarts) has been installed in five selected points including the cyclotron vault, the hot cells, area of quality control, chemical development laboratory, dispensing laboratory, PET/CT rooms and the air extraction system.

All the laboratories are provided with portable monitors (GM, Biodex).
All the exposed staff members carry films and TLD rings. Dose dispensing is manually performed, being a critical operation in the whole process.



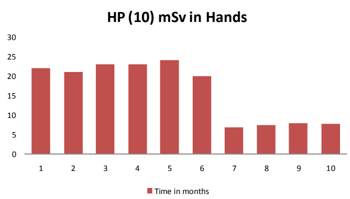
The centralized radiation monitor system was enlarged to twelve acquisition points allowing full registration of all the areas involved (production, dose dispensing and administration. Personal digital dosimeters have also been distributed to exposed personel.



A shielded dispensing system was introduced to diminish radiation doses. During labelling of ^{68}Ga-DOTATATE a purification step on a solid phase column was identified as critical concerning irradiation to the staff. An additional shielded system was designed to reduce radiation dose.

5.- Conclusions

Due to all the modifications introduced to reduce radiation doses in the staff involved in production and quality control, a decrease in 60% of the original expose dose was obtained.



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