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PhD in Medical Sciences
2017-2018

INVITATION to the Public defence of

Edilaine Honorio da Silva

To obtain the academic degree of '**DOCTOR IN MEDICAL SCIENCES**'

Development of a practical eye lens dosimeter for interventional procedures in hospitals.

Monday 19 February 2018

Auditorium **Roger Van Geen, Lake House** 11:00
Belgian Nuclear Research Center, Boeretang 201, 2400 Mol

Summary of the dissertation

During procedures, interventional cardiologists and radiologists can receive high occupational doses from complex scattered X-ray radiation fields. Recently, reports have raised the concern that a link exist between chronic exposure to these fields and effects in unshielded tissues such as the eyes and brain. In addition, a lower occupational dose limit to the lens of the eyes has been recommended in response to studies showing that cataracts can occur at threshold doses lower than previously assumed. Medical doctors can exceed this dose, due to their high workload, the complexity of the procedures performed and proximity to the radiation. Therefore, routine assessment of the eye lens dose and optimized protection, such as the use of lead glasses and lead caps, are now to be considered. The aim of this project was to develop an eye lens dosimeter suitable to be used together with lead glasses in the complex radiation field to which medical doctors are exposed. This was done by numerical and experimental methods. Firstly, a rod-shaped radiophotoluminescent dosimeter was characterized and re-designed to improve its angular response which makes it suitable for eye lens dosimetry, independently of the angle of the scatter radiation. Secondly, the influence of where the dosimeter is placed on lead protective glasses on determining the dose received by the eye lens was evaluated. This study showed that the optimal position for the dosimeter is over the lead glasses, close to its bridge over the nose. In a parallel study, the efficiency of several protective devices in reducing the dose received in the white matter and hippocampus of the brain was investigated. Our study demonstrated that suspended ceiling screens are the most effective and decrease the dose to the brain tissue by around 70%. Depending on their type, lead caps provide a protection from only 6% up to about 70%.

Curriculum Vitae

Edilaine Honorio da Silva was born on 4th of July, 1986, in Itápolis/SP, Brazil. Got her bachelor (2010) and Master in Physics (2013), both by the Federal University of São Carlos, Brazil. She joined the Faculty of Medicine and Pharmacy of the VUB in 2013 aiming at developing an eye lens dosimeter to be used by interventional medical doctors, in a collaboration with the Belgian Nuclear Research Centre (SCK•CEN), in Mol. The PhD project was performed under the promotorship of Prof. Dr. Nico Buls (VUB) and mentorship of Dr. Filip Vanhavere (SCK•CEN), with a grant from the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, Brazil. The results obtained along the 4-years project were presented at 8 international conferences and published in 3 international peer-reviewed articles. The dosimeter that she developed is aimed at being commercially available after final creditation.