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Dosimetric evaluation of a detailed eye model in head computed tomography examinations

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Radiation exposure to the eye lens may occur within medical setting like head CT examination. Eye lens is sensitive to exposure by ionizing radiation mainly relating to the induction of cataract. ICRP publication, 118 recommended a threshold dose of 0.5 Gy for both acute and fractionated exposures for radiation-induced cataracts. As stated, cataract may be caused by the radiation injury to the germinative zone of the lens epithelium, which contains actively dividing cells. In the literature, eye was simply modeled containing lens and bulb and the cataract threshold was compared by the dose delivered to total lens. Recently, Nogueira et al., developed a detailed eye model, in which germinative zone was considered as the sensitive zone to ionizing radiation. Therefore, in this study, Nogueira eye model was developed and inserted in the head of ICRP reference adult male (AM) phantom, then dose values in head CT scan were calculated by Monte Carlo simulation and were compared with those obtained by AM simple eye model. The obtained results shows that despite the similarity of total lens dose in both models, the amount of dose delivered to the sensitive zone of the Nogueira model is higher than the lens dose of simple model up to 5%. So, if there is a small threshold for inducing cataract, considering the detailed eye model and using more accurate results of dose are beneficial to optimize patient's radiation dose, to update the information about individual risk and to protect the lenses during head CT scan.

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Biosensors: An important tool to detect bacterial pathogens

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A biosensor is an analytical instrument employed for the detection of an analytes, where a biological component is combined with a physicochemical detector. The present paper focuses as overview of various physical and chemical techniques viz., fluorescence and infrared spectroscopy, chromatography, flow cytometry and chemiluminescence as a basis for the construction of biosensor to identify the pathogenic bacteria. A thorough discussion of publications dealing with biosensor for detection of bacteria has been made in this paper. This review indicates current advances of alternative enzyme development to detect bacterial pathogens in clinical diagnosis and environmental monitoring. Enzyme, nucleic acid and antibody- based biosensors have been discussed based on biological treatment employed. On the basis of basic transducer principles, recent advance in biosensing technology that use electrochemical, piezoelectric, acoustic, optical and thermal biosensor are discussed for the detection of pathogenic bacteria. Special emphasis is given to methods to improve the analytical parameters of biosensor including analysis time and sensitivity as well as automation of assay procedure. Current developments in flow injection, immuno-filtration and flow through biosensor for bacterial detection are overviewed from the system's engineering point of view. Future prospects for biosensor developments and problems associated with the commercialization of bacterial biosensor are discussed in details.

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