Universidade de São Paulo
Instituto de Física de São Carlos

XI Semana Integrada do Instituto de Física de São Carlos

Livro de Resumos

São Carlos
2021

Semana Integrada do Instituto de Física de São Carlos

SIFSC 11

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Ficha catalográfica elaborada pelo Serviço de Informação do IFSC

Semana Integrada do Instituto de Física de São Carlos
(11: 06 set. - 10 set. : 2021: São Carlos, SP.)
Livro de resumos da XI Semana Integrada do Instituto de Física de São Carlos/ Organizado por João H. Melo Inagaki [et al.]. São Carlos: IFSC, 2021.
412 p.
Texto em português.
1. Física. I. Inagaki, João H. de Melo, org. II. Titulo

ISBN 978-65-993449-3-0 CDD 530

PG89

Photon-mitochondria interaction and the effects on quantum regimes

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Photodynamic therapy (PDT) has been widely used and its an approved photo- activated and non-invasive medical technique for treatment of several diseases, including different cancer types, obesity and infections. It involves administration of a photosensitizing agent which is activated by a specific wavelength. Its results in a sequence of chemical and biological processes that generates reactive oxygen species (ROS), the excesses of this species leads to an irreversible sick cells photodamage. Mitochondria are among the targets of photodamage, it is believed that once mitochondrial membrane permeability is affected by radiation it leads to cell apoptosis. (1) Mitochondria are membrane-bound organelles primary responsible for the production of adenosine triphosphate (ATP), due the high-energy in the phosphate bond it provides energy for innumerable reactions within the cell. Differently of other intracellular organelles, mitochondria have two distinct membranes and they own genome. These organelle structures are variable depending on the cell type, in general can assume spherical and elongated shapes. In multicellular organisms, mitochondria can have variable morphologies once different tissues have distinct energy needs. (2) Despite reported demonstrations in cell and tissues the mechanism which involve mitochondria-electromagnetic radiation interaction in phototherapy is still poorly understood. Evidence of the importance of the mitochondria in the cell death due PDT has been reported, however the conclusions around the death process remain controversial. Our purpose is investigating the response of mitochondria-photon interaction and its quantum effects. Isolated mitochondria from rat liver using the differential centrifugation technique (3), will be lighted with different wavelengths in biological condition, the mitochondria respiration will be controlled using Oroboros® equipment. Furthermore, Raman spectroscopy measurements are going to be used to obtain chemical and structural information that helps to understand the possible mitochondria structure changes. Finally, we are going to associate ultrasound, ultraviolet light, x-ray and microwave to investigate the response of mitochondria to these radiations.

Palavras-chave: Mitochondria. Quantum effects

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