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Instituto de Física de São Carlos

XII Semana Integrada do Instituto de  
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SIFSC 12

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## PG9

### Effects of electromagnetic radiation on the mitochondria bioenergetics

PEREZ, Aline Sanches; INADA, Natalia; MEZZACAPPO, Natasha; VOLLET FILHO, Jose Dirceu; CASTILHO, Roger Frigerio; VERCESI, Anibal Eugenio; BAGNATO, Vanderlei Salvador

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Mitochondria were recently known as the main targets of electromagnetic radiation; they also play an important role in the cell maintenance. These organelles are responsible for more than 85% of the cell energy production in ATP molecules. Mitochondria are among the targets of photodamage, it is believed that once mitochondrial membrane permeability is affected by radiation it leads to cell apoptosi. (1) Despite the advances already achieved in the understanding of electromagnetic interaction with mitochondria, there are gaps regarding the detailed understanding of the action mechanism at atomic, cellular and bioenergetics levels, especially in the action of radiation outside the visible spectrum. This study proposes to investigate the effects of electromagnetic radiation, on X-ray, ultraviolet (UV) and microwave (MW) spectrum, on the bioenergetics of isolated mice liver mitochondria. The main parameters treated in this study are mitochondrial respiration and swelling, high resolution respirometer and spectrophotometer were used. This is the first study showing the immediately bioenergetics alterations, at mice liver mitochondria, systematically correlating mitochondrial respiratory paths and swelling due X-ray, UV and MW irradiation. Here, we shown that is a correlation between dose effects and electromagnetic wave nature, which has a linear behavior at UV and MW, but no direct nor linear correlation at X-ray spectrum, suggesting that we may also have other phenomenon contributing with mitochondria pathways once X-ray can ionizing atoms and molecules, specially water which is widely used in mitochondria respiration. In addition, all three radiations interfered with the viability of mitochondrial lipid membranes, especially the inner membrane which was investigated by mitochondrial swelling even in low doses. .

**Palavras-chave:** Electromagnetic effects. Isolated mitochondria. Respiratory paths.

**Agência de fomento:** CNPq (130160/2021-0)

#### Referências:

1 GREEN, D. R.; REED, J. C. Mitochondria and apoptosis. *Science*, v. 281, p.1309-12, 1998.