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45TH CONGRESS OF BRAZILIAN BIOPHYSICS SOCIETY (SBBF)

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PROGRAM AND ABSTRACT BOOK

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Ilustração da Capa: Alexandre Takashi

EB.12 - Reconstitution of Leishmania plasma membrane to understand the photodynamic effect

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Leishmaniasis is an important neglected disease. Photodynamic therapy (PDT) has been used to fight cutaneous leishmaniasis showing good results. However, PDT mechanisms in Leishmania parasites are not yet completely clarified. In this work, our objective was to develop a protocol to produce giant plasma membrane vesicles (GPMVs) from *Leishmania amazonensis* promastigotes to understand the mechanisms of action of methylene blue (MB)-mediated PDT on the cell membrane of parasites. For membrane extraction, several techniques were tested. The osmotic shock was the technique that presented the best yield and effectiveness. Phosphate and protein measurements were performed to confirm membrane extraction. For the growth of GPMVs, the best technique was electroforming using different frequencies and voltages in 4 cycles. Reconstituted GPMVs were observed by phase-contrast light microscopy. Subsequently, PDT was applied to GPMVs dispersed in an aqueous solution containing 50 μM MB and we verified the changes in permeability before and after exposure to light. The same process was applied to giant unilamellar vesicles (GUVs) with lipid compositions similar to the parasite membrane. The electroforming technique with the protocol developed in this work made it possible to obtain GPMVs from a promastigote membrane isolate of *L. amazonensis*. The membrane isolation technique was effective to extract the parasite's membrane while preserving lipids and proteins. In GUVs we observe an increase in the area during PDT in different compositions and loss of contrast. The GPMVs showed a loss of contrast as well as the GUVs but did not show an increase in area. This factor could be explained by the high degree of complexity of the membrane, which contains membrane proteins in addition to containing lipids.
Keywords: *Leishmania amazonensis*, GPMVs (Giant Plasma Membrane Vesicles), PDT (Photodynamic Therapy)

EB.13 - Enhanced action of nanoencapsulated herbicide on photosynthesis and antioxidant activity in spinach leaves: toward a sustained weed control?

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Despite a wide range of possible applications of nano-enabled pesticides, the mechanisms involved in their enhanced action remain largely unknown. Understanding the interaction between nanopesticides and plants is crucial for evaluating their potential safety application. Using an experimental and theoretical approach, this study aimed to investigate the target effect of paraquat-loaded chitosan/tripolyphosphate nanoparticles on the photosystem I (PSI). Chitosan/tripolyphosphate nanoparticles carrying paraquat was prepared by ionic gelation method. Nanoformulation was characterized, and the amount of lipid peroxidation, photooxidizable P700 reaction center content, NADPH/NADP+ ratio levels, and antioxidant enzymes were evaluated in spinach leaf tissue exposed to the nanoherbicide compared to the non-encapsulated herbicide. Biochemical traits of PSI were significantly decreased in spinach leaf tissue exposed to the nanoherbicide. Our data also revealed that nanoformulation might act promoting oxidative stress by changes observed on antioxidant enzymes. Also, the molecular docking results showed a preferential disposition of the herbicide paraquat and paraquat-tripolyphosphate complex (TPP:PQ) into the ligand domain close to FAD and Glu312. Due to the inhibitor's strategic position into the catalytic pocket, a model of electron-capture is proposed, where the herbicide disturbs the redox process NADP+ ⇌ NADPH by capturing electrons to reduce itself. Our findings provide important insights into changes induced on targeted action mechanisms may play a key role in its increased herbicidal efficiency. Thus, our findings contribute to a better understanding of the mode of action of herbicides encapsulated in polymeric nanoparticles.
Keywords: Nano-enabled agrochemicals, Enzymes, Photosynthetic electron transport
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