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Evaluation of Photodynamic Therapy with Methylene Blue, by The Fourier Transform Infrared Spectroscopy (FT-IR) in *Leishmania major - in vitro*

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Abstract: Cutaneous Leishmaniasis (CL), a parasitic disease caused by protozoa from the genus *Leishmania*, affects the skin and mucous membranes. Current treatment modalities have severe side effects, underlining the need for alternative treatments. One of the emerging techniques is Photodynamic Therapy (PDT), wherein a photosensitizer delivered inside pathogen is activated by irradiation, resulting in generation of reactive oxygen species, killing the pathogen. A detailed study of chemical changes within the pathogen due to this therapy may help improve therapeutic efficiency. Therefore, in this study, Fourier Transform Infrared Spectroscopy (FT-IR) was used to investigate the chemical profiles of *Leishmania major* promastigotes in culture after PDT and compared with untreated pathogens. Results suggest increase in proteins, nuclear material, and disordered and β-sheet protein structures; and decrease in lipids, carbohydrates, and α-helix and turns, bends protein conformations. The Amide I band analysis showed the conformational changes in protein secondary structure. These chemical changes may be associated with known effects of PDT - membrane degradation, and reduction in the energy source of the parasite.

Keywords: *Leishmania major*; Methylene blue; Photodynamic therapy; FT-IR spectroscopy.