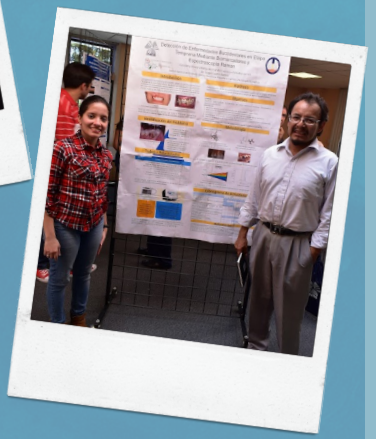

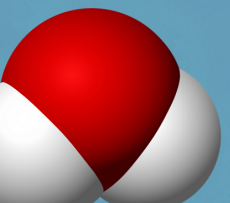

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BIOMEDICAL OPTICS INSTRUMENTATION GROUP

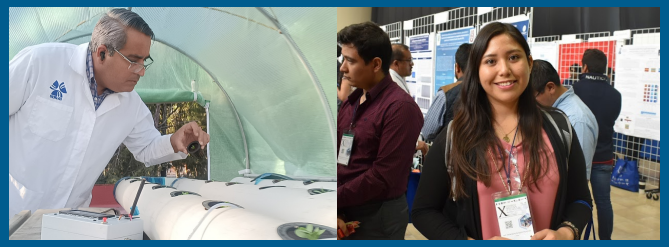
We belong to the Biophotonics area, related to optics coordination, and do theoretical and experimental research on the interaction of optical radiation with biological tissues, including studying human tissue samples with patients to establish our diagnostic methodologies for chronic diseases.

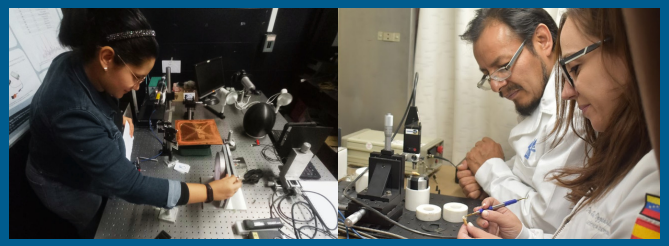
RESEARCH PROBLEM:

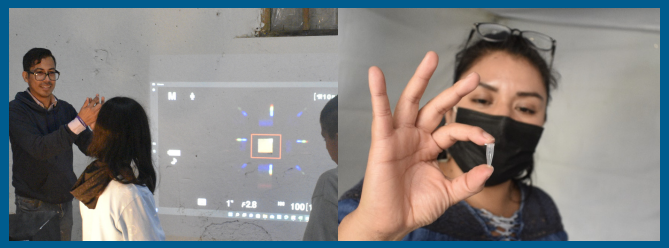
The interest is to solve public health problems since they are currently solved with invasive techniques whose diagnostic time is long since almost all require a pathological study of tissue samples. This sampling is an invasive process and, in some cases, causes pain and bleeding. Additionally, with current diagnostic procedures, detecting cancer cells in the early stages of the disease is impossible.

PROPOSAL:

Analyzing the interaction of light and biological tissues is an alternative for diagnosing abnormal tissues. The tools for such diagnosis are diffuse reflection spectroscopy and Raman spectroscopy, which provide information through the light reflected by the tissues under study, depending on the light used to illuminate the samples. By using spectroscopy from the ultraviolet to near-infrared band, healthy cells can be distinguished from diseased cells, allowing non-invasive diagnosis.

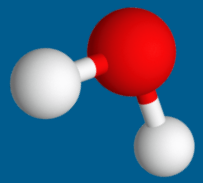






RESEARCH AREAS:

- Diffuse reflectance spectroscopy.
- Optical Coherent Tomography (OCT).
- Raman spectroscopy.
- Quantum chemistry.
- Optical simulation.
- Machine learning.
- Thermography.
- Optical design.
- Biophotonics.



SOCIAL IMPACT:

- Training of human resources at the master's and doctoral levels.
- Integration of INAOE with BUAP through its University Hospital (UH).
- Transfer of research results to UH.
- Linkage with civil society organizations and companies, such as CEPREC, NOVAVISON and IMSS.

PROJECTS:

- Design and development of a CTIS system for the study of hyperspectral images for skin cancer detection.
- Analysis of bone tissues for the diagnosis of diseases such as arthritis and osteoporosis.
- Simulation of biomolecules using quantum chemistry programs.
- Study of saliva for detection of oral diseases and stress-related biomarkers.
- Identification of biomarkers in tears for the diagnosis of chronic diseases.
- Study of glycosylated hemoglobin for diabetes diagnosis and follow-up.
- Growth and health monitoring of vegetables in hydroponic media.
- Breast cancer identification through thermography.
- Transillumination of breast by diffuse light.
- Optical designs focused on cameras, telescopes, and microscopes.
- Comparison between medicinal plants and drugs.