



**Instituto Nacional de Astrofísica,
Óptica y Electrónica**

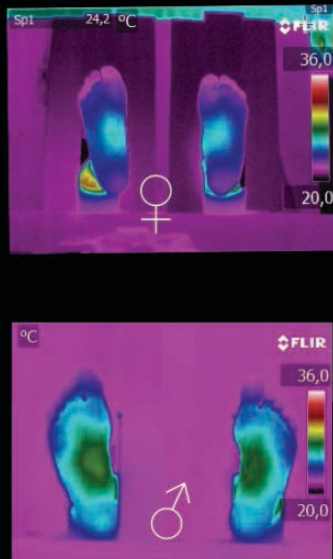
Posibles contribuciones del INAOE

Ruben Ramos García

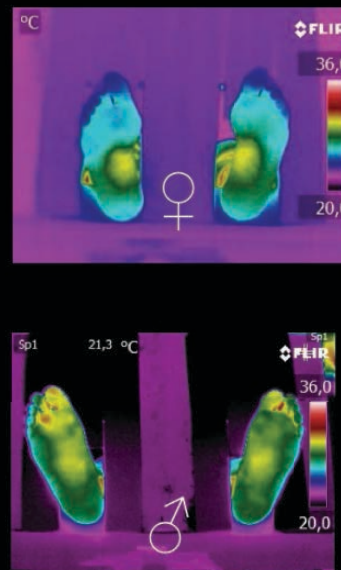


Termograma

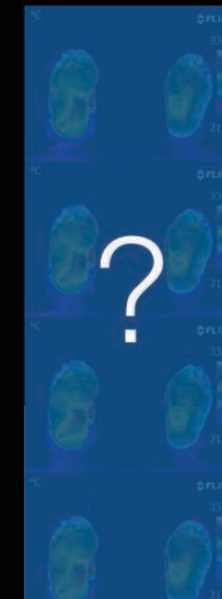
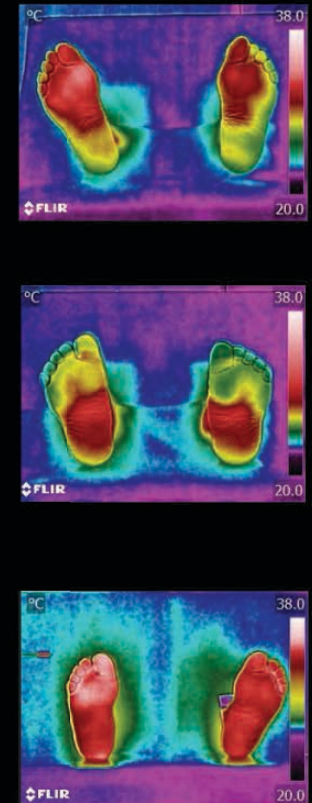
Sano



Sobrepeso u obeso



diabético



Encontré una pista en la identificación del paciente en riesgo de desarrollar pie diabético.

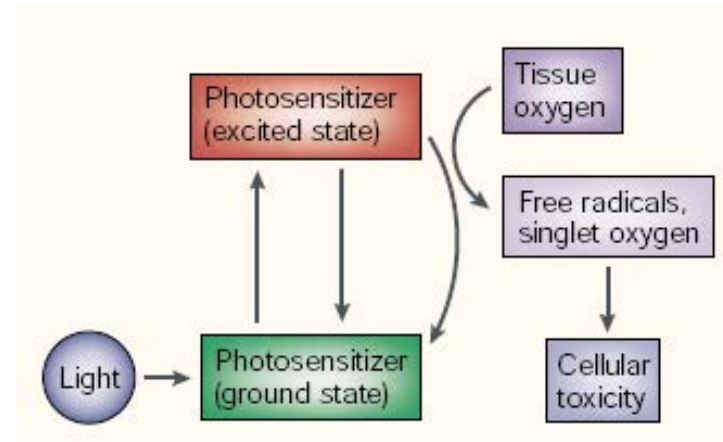
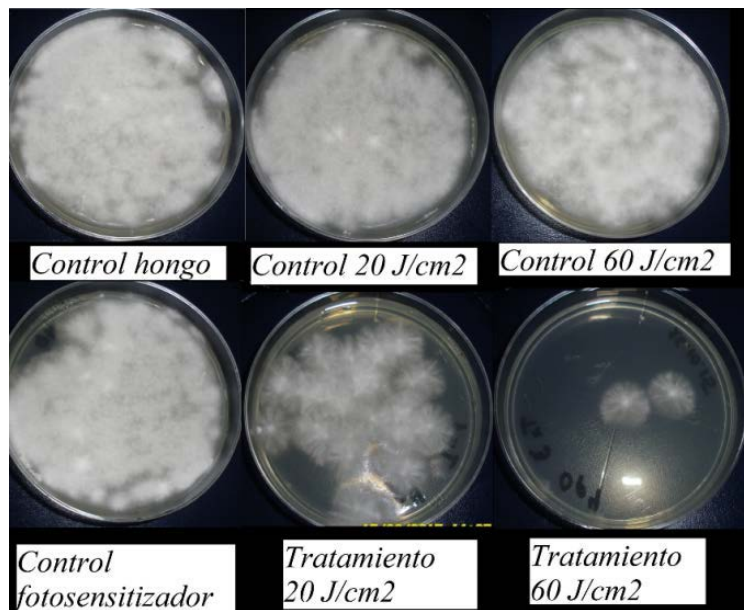
Identifiqué, en forma temprana o corroboración, otras enfermedades.

Photodynamic Therapy

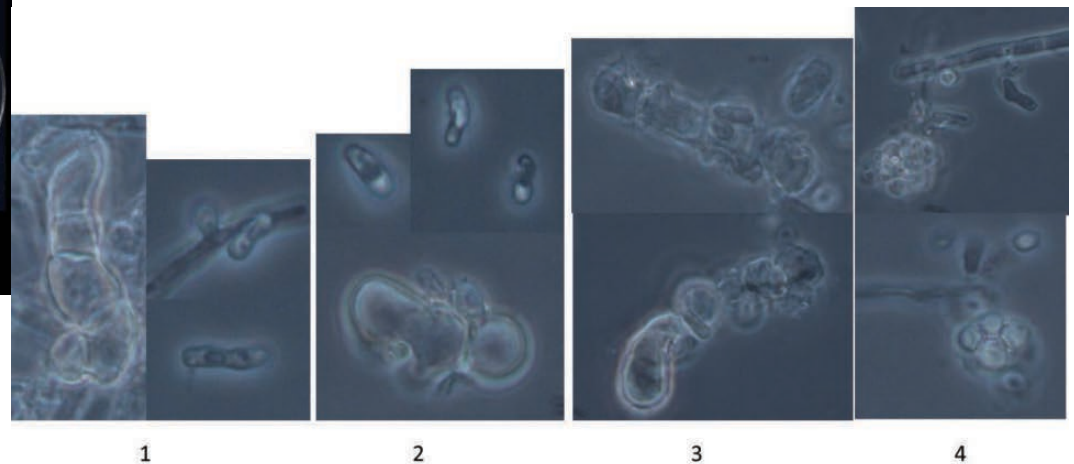
Dr. Teressita Spezzia Mazzoco & Ruben Ramos Garcia



First results on PDT at INAOE



The killing of fungus seems likely to occur by apoptosis



Cervix cancer & bacteria (biofilms) studies in collaboration with Mexican health institutions (CIBIOR, IMSS, CMN), Pie diabético

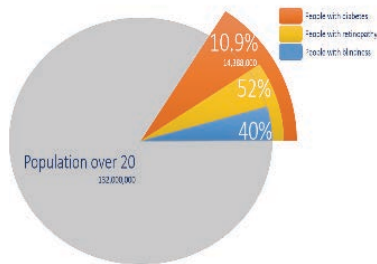
Tamizaje de retinopatía diabética

Contacto: Dr. Carlos G Treviño Palacios

carlost@inaoep.mx

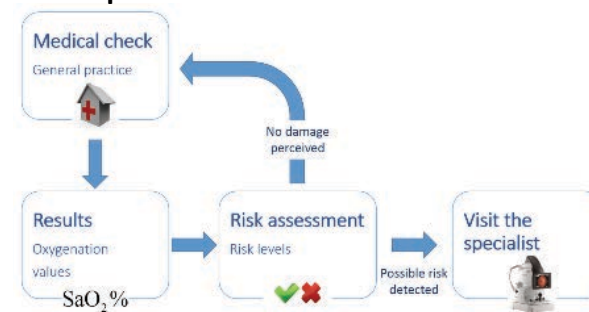
Problemática:

Alta incidencia de ceguera por diabetes

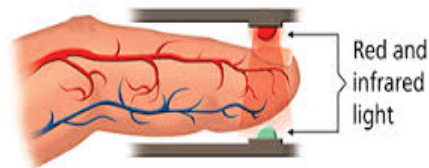


Olaiz G. Encuesta Nacional de Salud 2000. Tomo 2. Instituto Nacional de Salud Pública, 2003.

Meta: Tamizaje por profesionales de la salud no especialistas

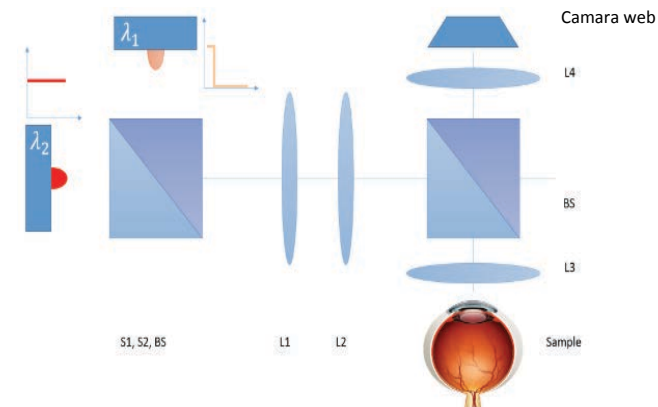


Objetivo: Desarrollar un dispositivo portátil simple para monitorear la saturación de oxígeno en fondo de ojo (oxímetro retinal)



Oxímetro en transmisión

Colaboración INAOE-IOCV (Conde de Valenciana)



Oxímetro en reflexión

Detección de glucosa y hemoglobina glicosilada

Dr. Jorge Castro Ramos

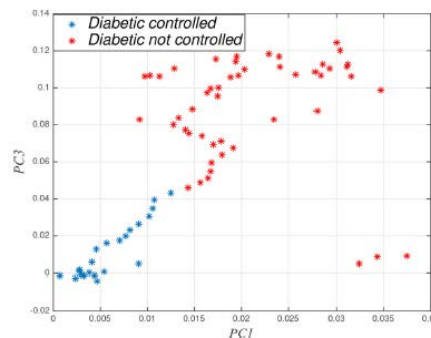
El objetivo es diferenciar entre pacientes diabéticos con alto y bajo nivel de HbA1c y usando espectroscopia Raman, evitando de esta manera lo doloroso de una punción.



Las regiones que se analizan y de las que se obtiene el espectro Raman son el lóbulo de la oreja, la frente, la punta del dedo y el pie.



Empleando máquinas de soporte vectorial, análisis de componentes principales, y los espectros Raman, podemos clasificar entre pacientes con altos y bajos niveles de glucosa y hemoglobina glicosilada.



Raman spectroscopy and PCA-SVM as a non-invasive diagnostic tool to identify and classify qualitatively glycated hemoglobin levels *in vivo*

J. F. Villa-Manríquez^{*-1}, J. Castro-Ramos¹, F. Gutiérrez-Delgado², M. A. López-Pacheco¹, and A. E. Villanueva-Luna³

J. Biophotonics 1–6 (2016) / DOI 10.1002/jbio.201600169

Laser Speckle Imaging

Visualization of deep blood vessels & relative measurements of blood flow velocity

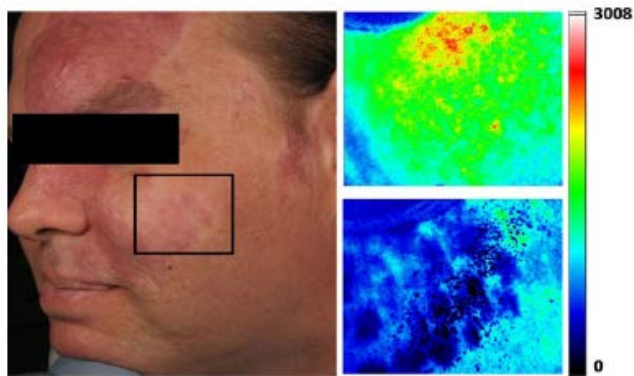


Fig. 4 Illustration of LSCI for monitoring PWS treatment. Left: Photograph of patient with PWS in the area indicated by the rectangle. LSCI images were acquired immediately before (upper) and 15 minutes after (lower) laser therapy. Figure graciously provided by Bernard Choi.

Functional LSI in brain

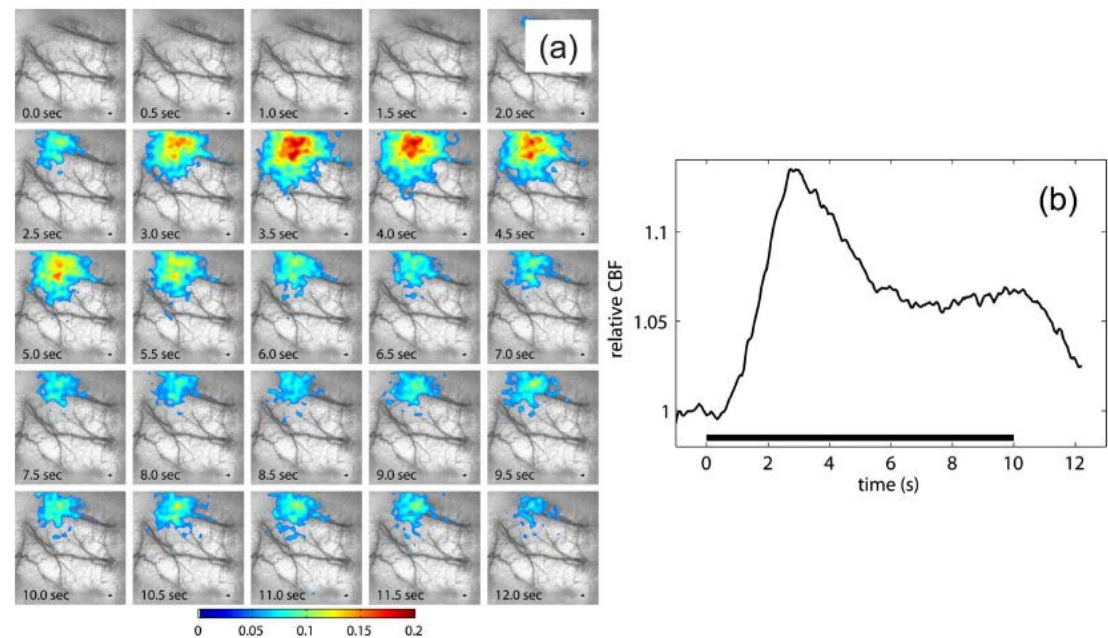


Fig. 5 Imaging of stimulus induced changes in blood flow in the brain. (a) Sequence of images showing the percent changes in blood flow in response to 10 s of forepaw stimulation and (b) graph illustrating the percent change in blood flow over a 1.75×1.75 -mm region of interest centered on the activation [see (a)]. Reproduced from Ref. 54 with permission.

Laser Speckle Imaging

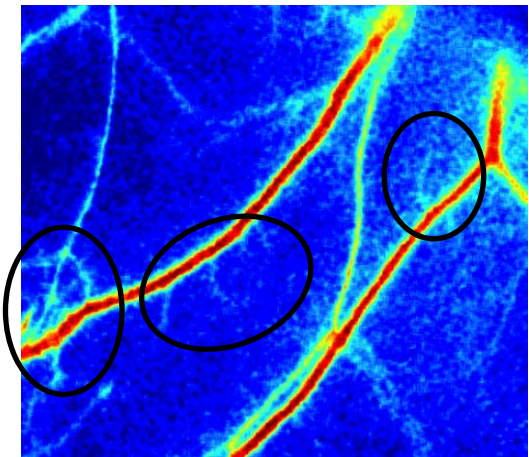
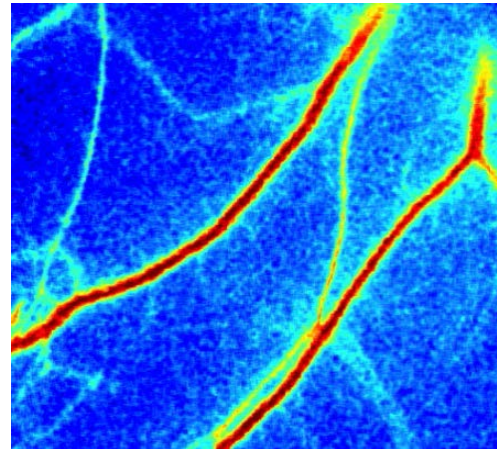
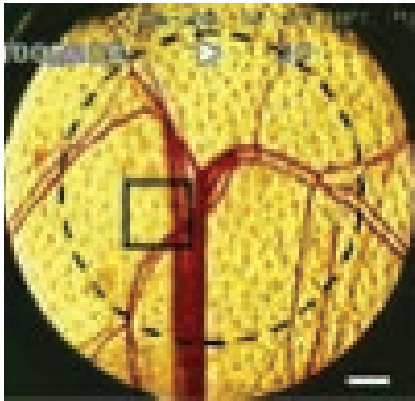
Principal Component Analysis

White light image

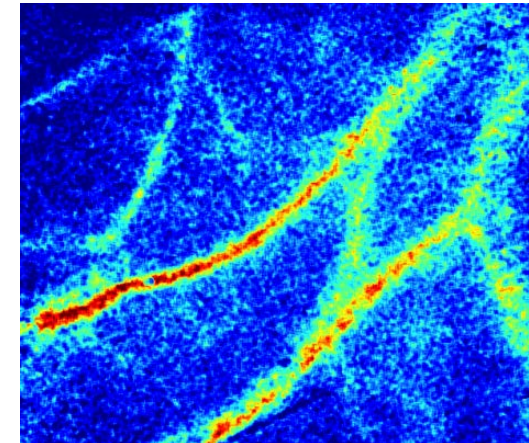
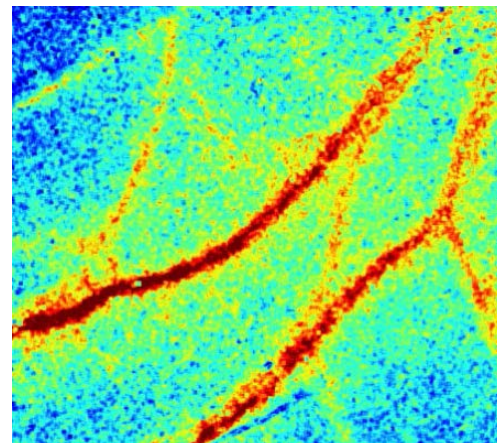
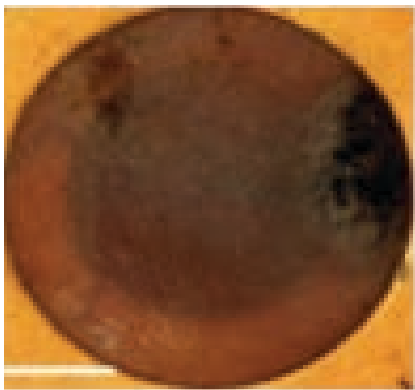
Blood flow image
without PCA

Blood flow image
with PCA

Sub-dermal
side



Epidermal
side



Other approaches: Homogeneity and co-occurrence matrix

Inyecciones sin Aguja (ni dolor)

Penetration depth into agarose-based skin phantom

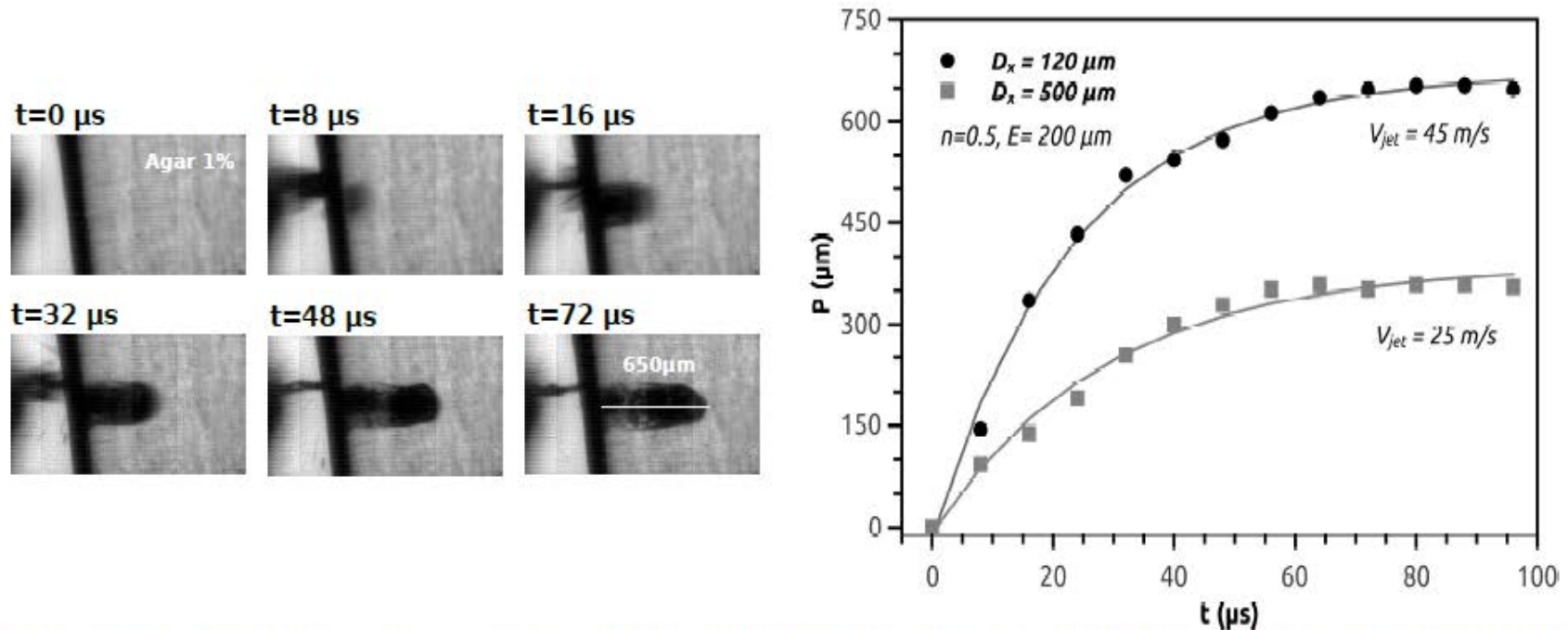


Figure 6. Image sequence of the liquid jet penetration into agarose 1% gel. Penetration depth as a function of time

Injected volume per shot $\sim 600 \mu L$