# Literature Review

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# *Optical Finger-Clip*

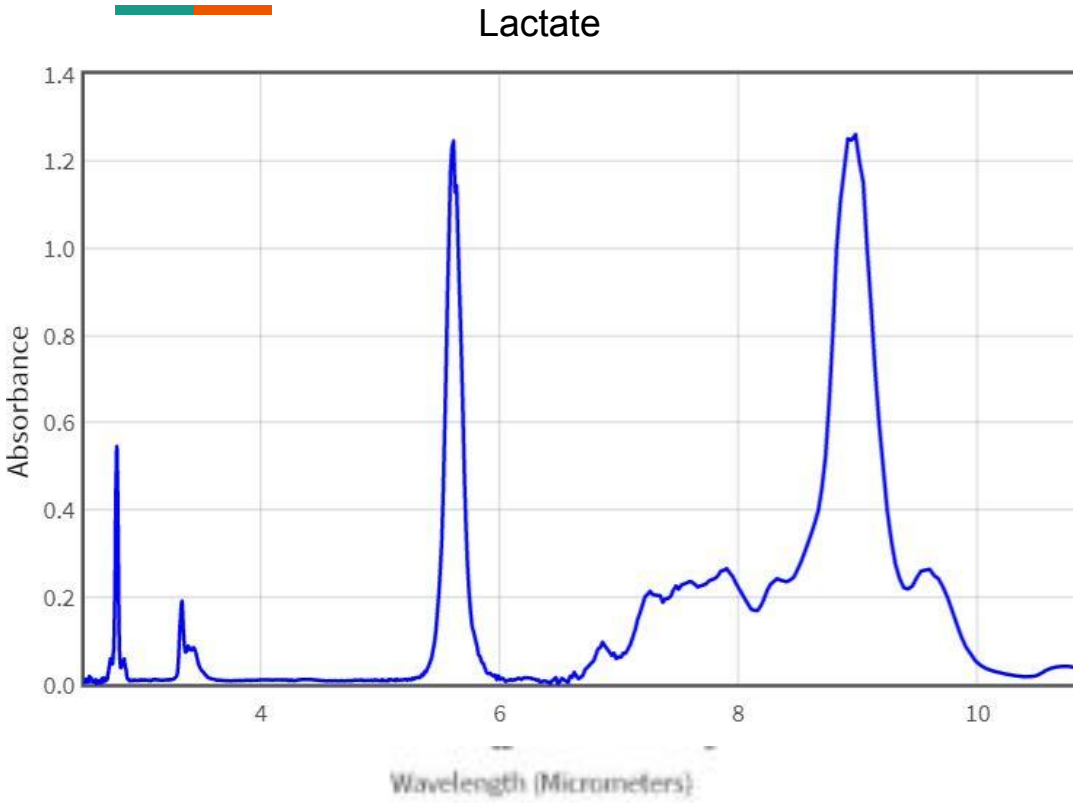
## Pros:

- Non-invasive
- Various applications (non-surgical)
- Maneuverable in O.R.
  - Takes up minimal space
  - Could fit in mobile stand

## Cons:

- Absorbance of different materials
- Potential radiation exposure
- Need testing for proof of concept
  - Minimal literature
  - One data point from paper
- Requires calibration/ potential spectroscopy equipment
- May not be as sensitive

# *Peak Absorbance Wavelengths:*

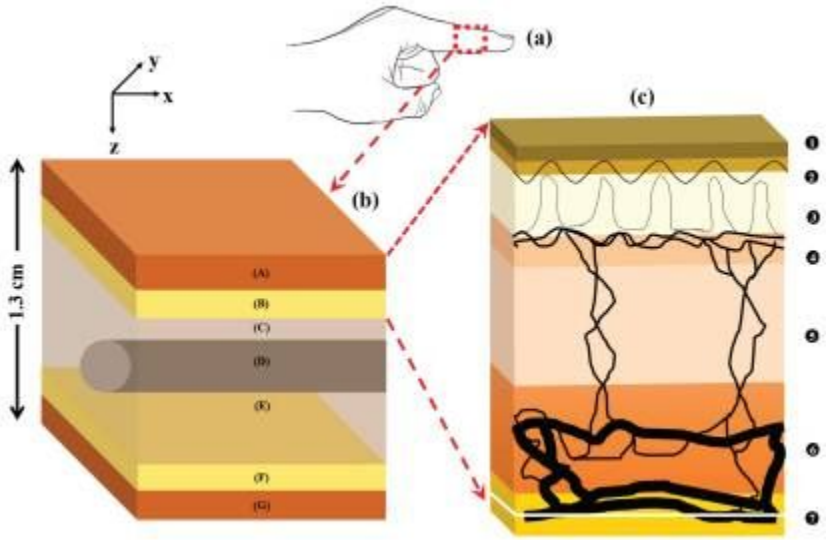



Peak absorbance values:

- 2.792 microns
- 3.340 microns
- 5.610 microns
- 8.900 microns

# Optical Design Approach

- Gopi and Kevin's Research stated on using 2.1 micron wavelength
- An article tested the concept in a 1 mm pathlength sample
- Could potentially use 2 wavelengths to account for the high absorption of water/blood near this wavelength
- Used Near Infrared Spectroscopy



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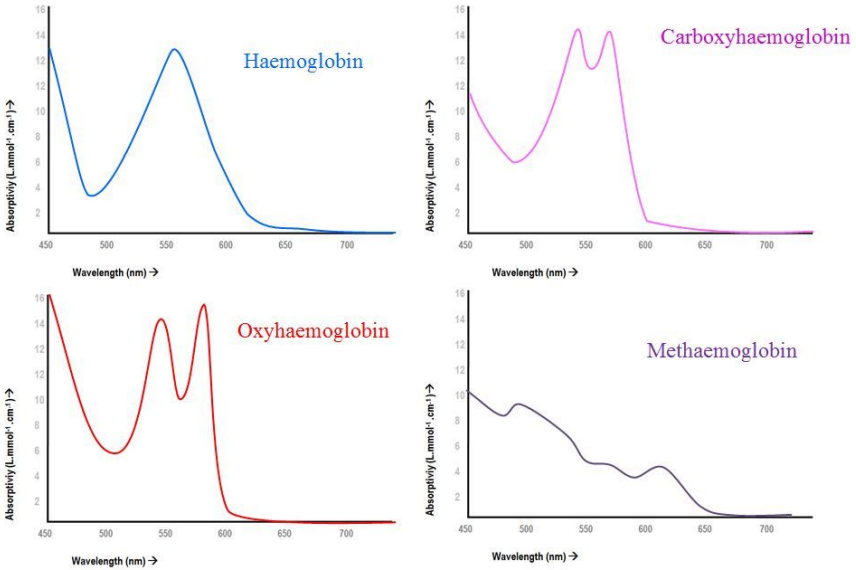
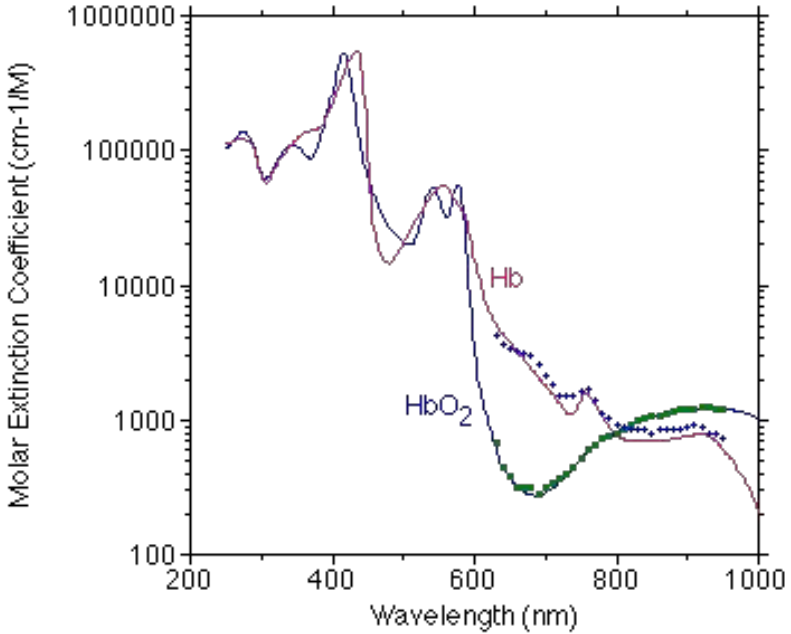
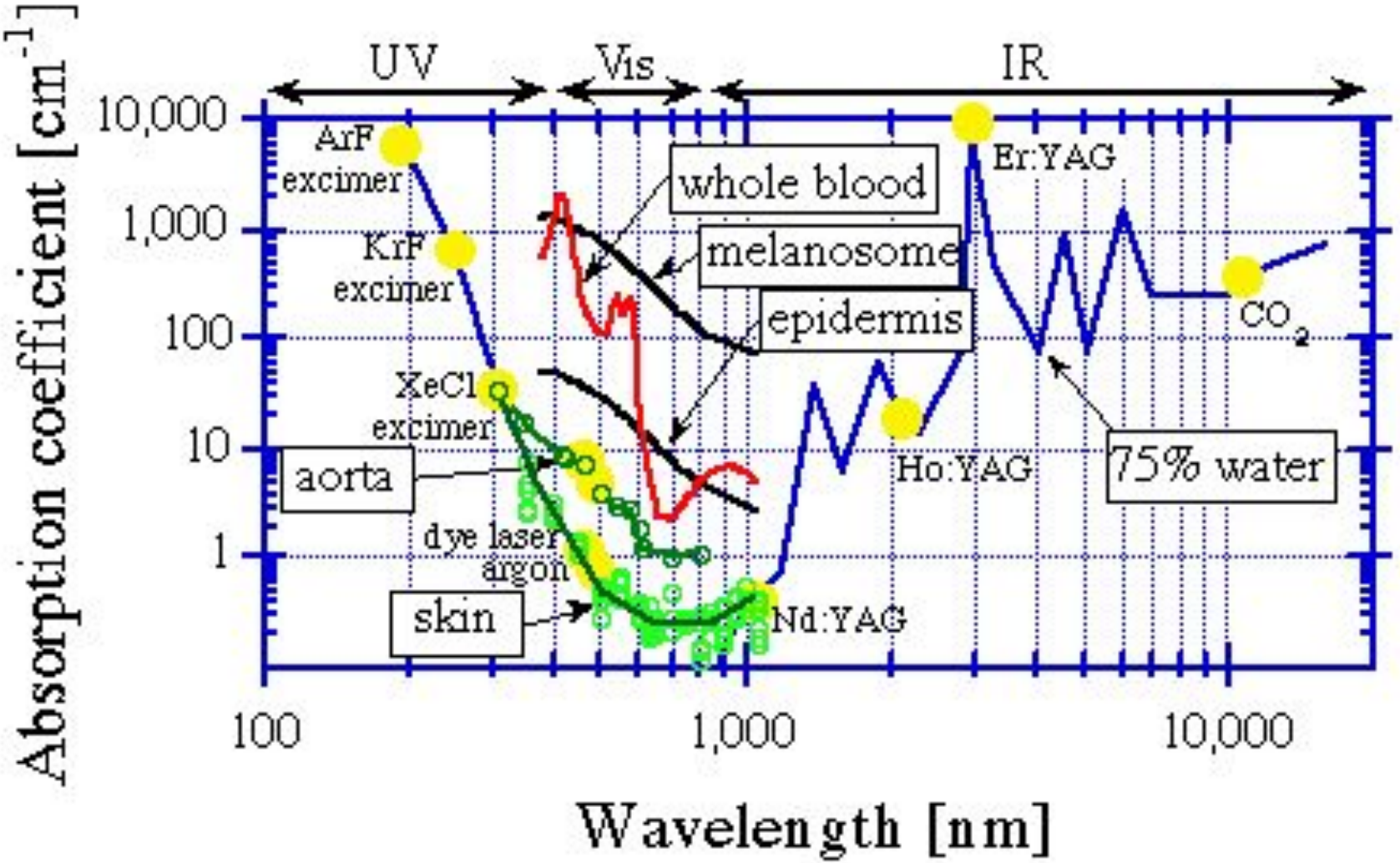



derangedphysiology.com

Hemoglobin

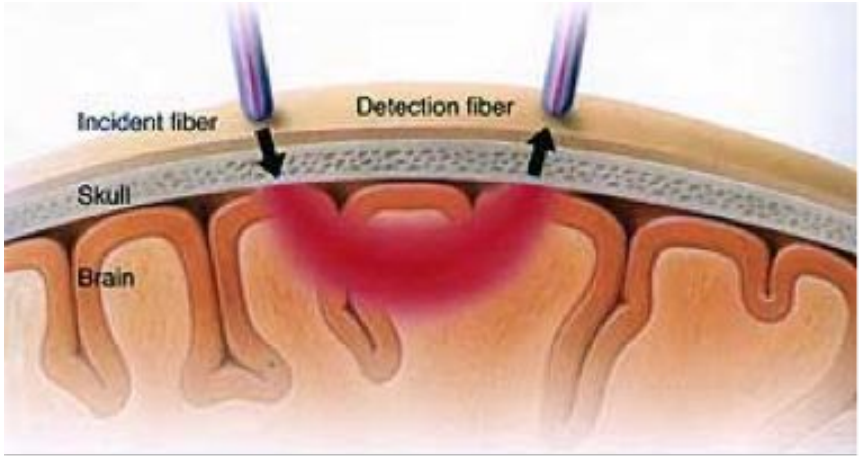



omlc.org/spectra/hemoglobin/


UV
Vis
IR
10,000
1,000
100
10
1
ArF
excimer
KrF
excimer
XeCl
excimer
dye laser
argon
Nd:YAG
Er:YAG
Ho:YAG
CO2
whole blood
melanosome
epidermis
aorta
skin
75% water
100
1,000
10,000
Absorption coefficient [cm-1]
Wavelength [nm]

# Near Infrared Spectroscopy

- Method that uses 780 nm to 2500 nm
- Used in Cerebral NIRS and Peripheral NIRS
- Requires calibration of diffuse reflectances
    - Multivariate
    - Partial least squares



# *Non-optical Electrochemical Methods*

## Pros:

- More accurate than optical methods for blood
- Can use sweat, blood, or saliva
- High specificity and selectivity

## Cons:

- Degradable enzymes
  - Difficult to store
- Invasive
- Difficult to quantitate accurate absolute concentrations

# Patents

- Analyte sensor
- Membrane for continuous analyte sensors
- Stabilized lactate responsive enzymes, electrodes and sensors, and methods for making and using the same

# *Next Steps / Game Plan*

- Find Kevin-Gopi setup
- Validate their data with more trials
- Determine viability
- Test with new solution
    - Lactic acid, iron (account for hemoglobin)

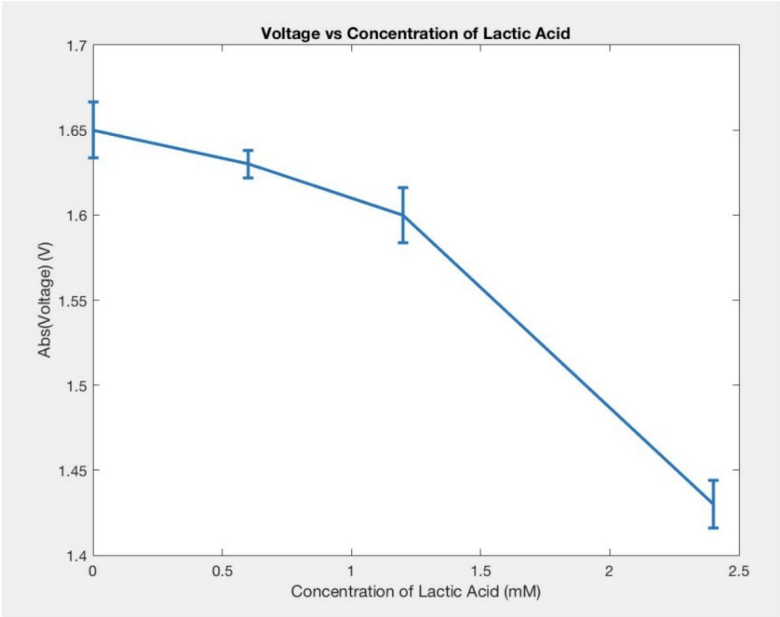



**Figure 7.** Graph of Voltage Response vs. Lactic Acid Concentration