



Photodynamic Therapy

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Overview

- Basically, photodynamic therapy (PDT) is the use of light activated compounds, known as photosensitizers, to kill target cells.

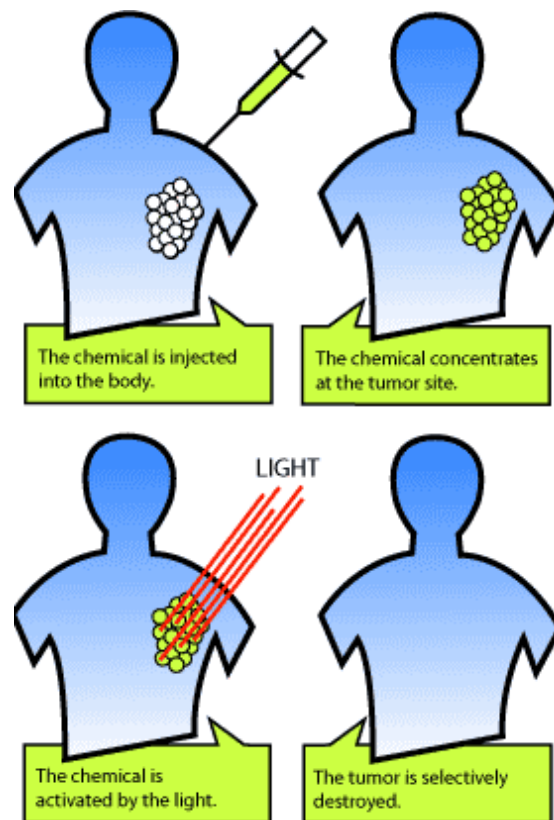


Image from:

www.photochembgsu.com/applications/therapy.html



Why is it important?

- It provides an alternative treatment for cancer
- It is efficient for treating skin conditions, such as acne
- It could overcome drug-resistant bacteria and treat fungal, viral and parasitic infections

Where do optics come in?

- In the activation of the photosensitizer
- In light's interaction with the tissues of the body

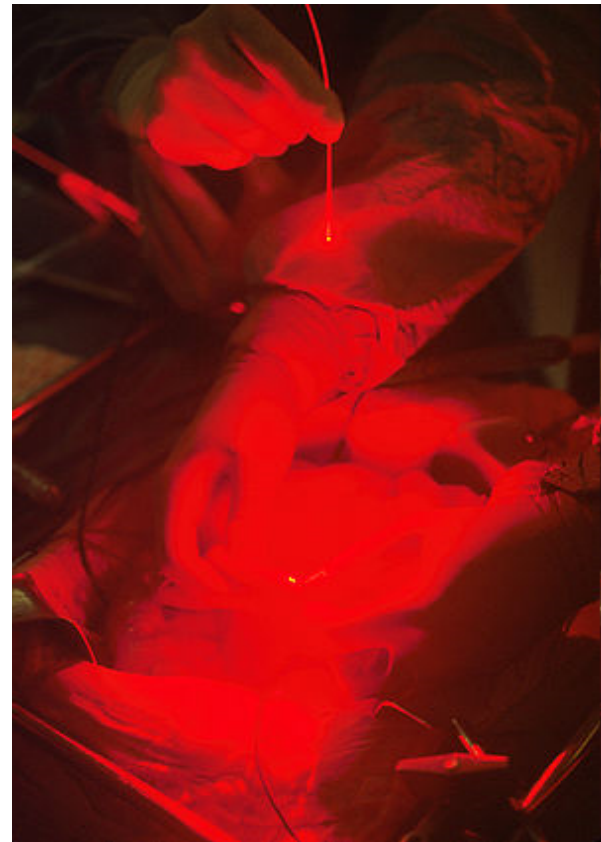


Image from:
www.answers.com/topic/photodynamic-therapy



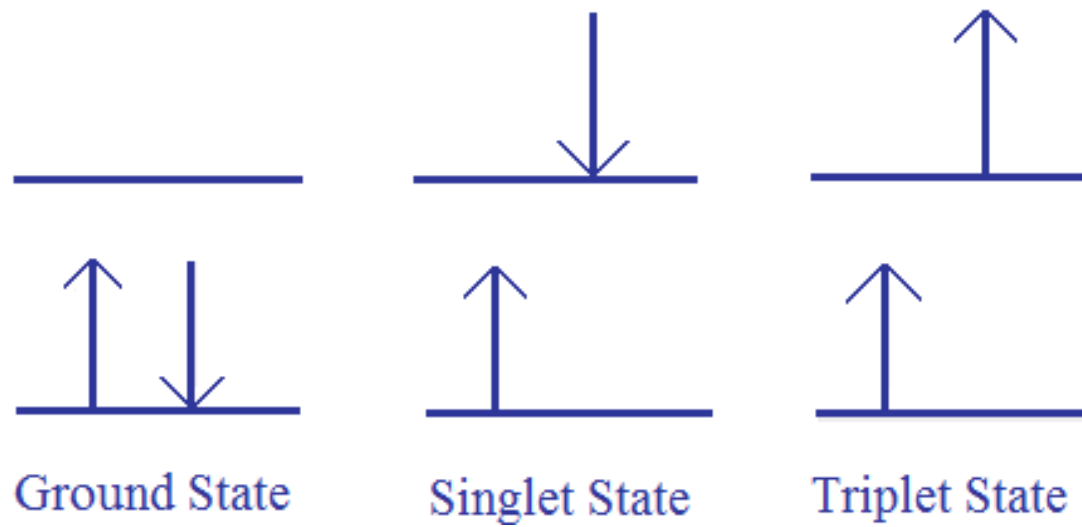
Activation of Photosensitizer



- S: molecule of photosensitizer
- $h\nu$: energy of applied light
- 1S : molecule in singlet state
- ISC: intersystem crossing
- T: molecule in triplet state



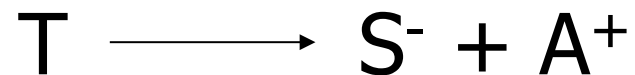
Activation of Photosensitizer



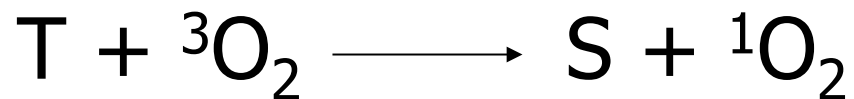


Activation of Photosensitizer

- Type I



- Type II



- The ion (A^+) and the singlet oxygen (${}^1\text{O}_2$) cause cell death



Light's Interaction with Tissue

- Light interacts with tissue in four different ways
 - Reflection
 - Refraction
 - Scattering
 - Absorption



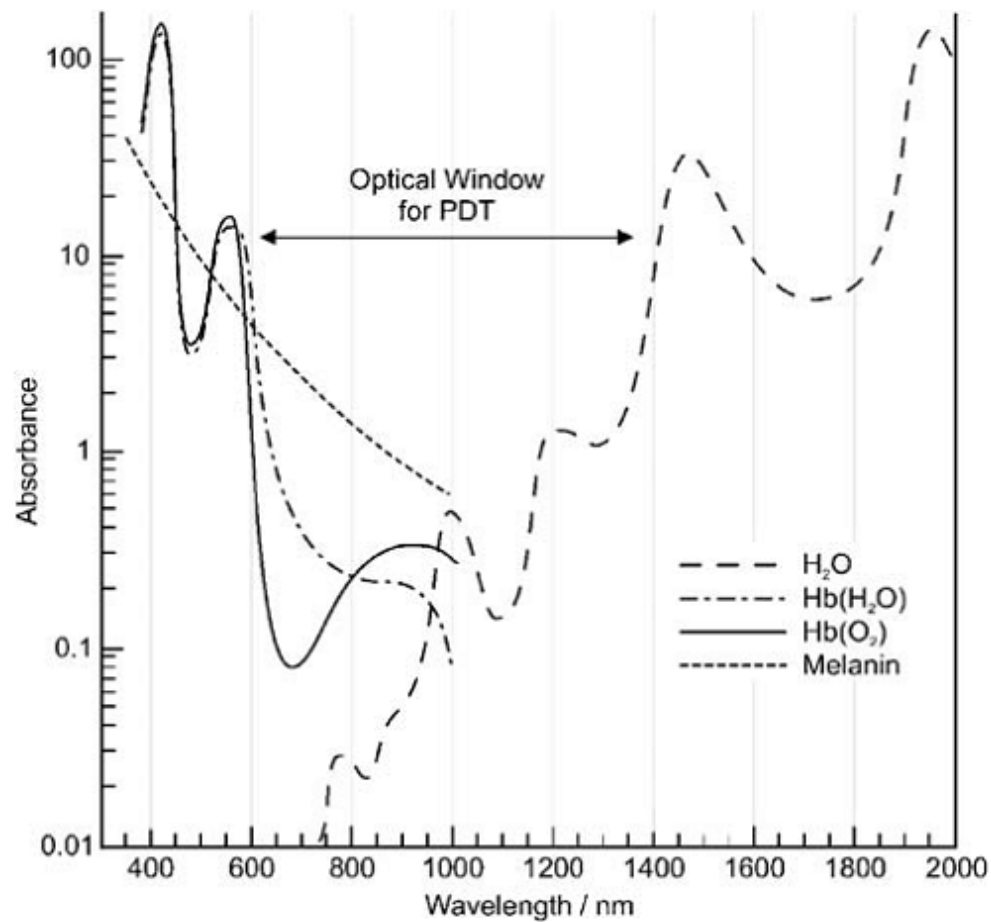
Light's Interaction with Tissue

- Intensity at a given depth (x)

$$I_x = I_0 e^{-(a_{\text{abs}} + a_{\text{sca}})x}$$

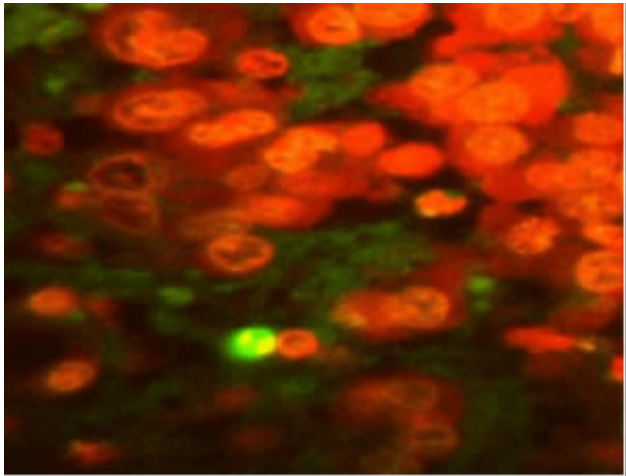
- I_0 : intensity at tissue surface
 - $a_{\text{abs}}/a_{\text{sca}}$: absorption and scattering coefficients
 - I_x : intensity at given depth
- Effective penetration depth is where I_x is 37% of I_0

Light's Interaction with Tissue

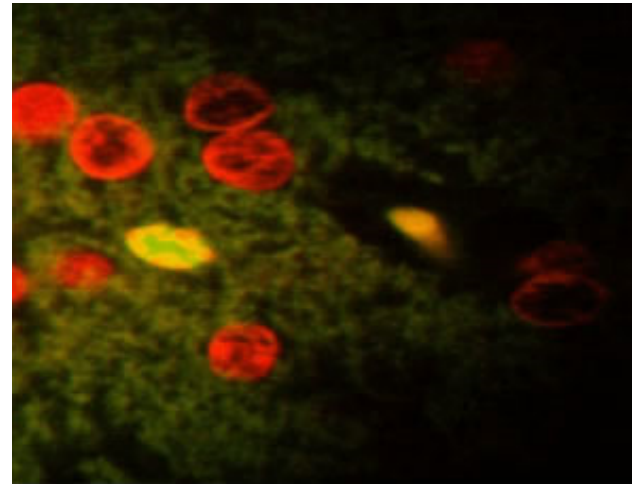




Applications: Cancer Treatment



Cancer cells 24 hours
after treatment



Cancer cells 72 hours
after treatment

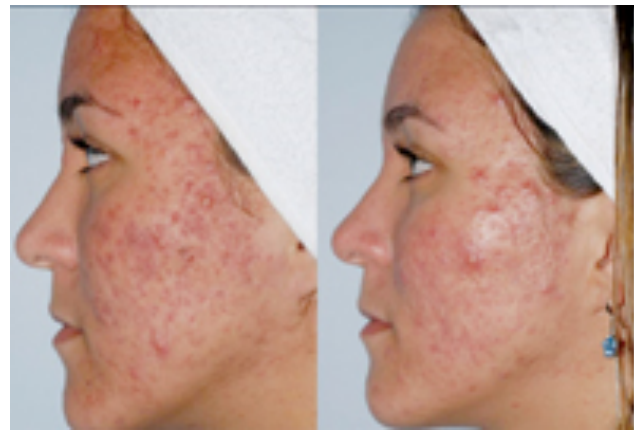
Images from: www.xytos.com/biotech_how.htm



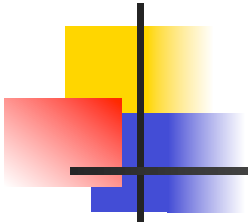
Applications: Acne Treatment



Male: Before and after one month of three sessions



Female: Before and after one month of three sessions



Thank you!