

# Optical clearing as a promising technique for in vivo optical imaging and treatment of hidden pathologies

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A brief description of modified concept of ‘tissue optical window’ and method of optical clearing (OC) based on controllable and reversible modification of tissue or cell optical properties by their impregnation with a biocompatible optical clearing agent (OCA) will be done. Fundamentals and major mechanisms of OC allowing one to enhance optical imaging facilities and laser treatment efficiency of living tissues and cells will be presented. Water transport in tissues and temporal tissue properties modification under OCA action, including reversible dehydration and shrinkage, balance of free and bound water will be analyzed. The enhancement of probing/treatment depth and image contrast for different human and animal tissues, including skin, eye sclera, muscle, cerebral membrane, cartilage, bone, blood vessels, and blood will be demonstrated using spectrophotometry, OCT, photoacoustic microscopy, linear and nonlinear fluorescence, SHG and Raman microscopy, polarization and speckle imaging. Experimental data on diffusion and permeation coefficients of glucose, glycerol, PEG, Omnipaque<sup>TM</sup>, albumin and other OCAs for normal and pathological tissues (cancer and diabetes) will be presented. Perspectives of immersion optical clearing/contrasting technique aiming to enhance imaging of living tissues by using different imaging modalities working in an ultra-broad wavelength range from free electron beam excitation (Cherenkov light emission) to terahertz waves will be discussed.

## References:

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