Séminaire externe

"Photoacoustics for biomedical imaging and treatment monitoring."

Photoacoustic imaging relies on generation of ultrasound waves from optically absorbing structures. The interest in the imaging modality has been steadily growing, and possibly is one of the most exciting biomedical imaging techniques of this decade. Most imaging algorithms however use only on the intensity of the detected photoacoustic waves in the image reconstruction. The ultrasound waves produced by the absorption of light in tissue can be analysed by methods developed to analyze ultrasound backscatter signals in the field known as ultrasound tissue characterization, but in this case the interpretation of the analysis is based on the physics of photoacoustic wave generation. In the absence of exogenous absorbers, blood is one of the dominant optically absorbing tissues. Hemoglobin in red blood cells is the main endogenous chromophore in blood. The spatial distribution of red blood cells in tissue determines the frequency content of the ultrasound signals produced. Analysis of the signals can reveal information related to the tissue vasculature. We are interested in cancer treatment monitoring. Tumor blood vessels have distinct organizational structure compared to normal blood vessels: normal vessel networks are hierarchically organized, with vessels that are evenly distributed to ensure adequate oxygen and nutrient delivery. Tumor vessels are structurally different: they are torturous and typically hyperpermeable. Therapies that target the vasculature can induce changes in the vascular networks that in principle should be detected using photoacoustic imaging. In this presentation we will show how the frequency content of the photoacoustic signals encodes information about the size, concentration and spatial distribution of non-resolvable blood vessels that can be used to assess treatment response and speculate how we can use photoacoustic imaging to guide drug delivery and monitor it's effects on tissues.

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Invité par Chantal Pichon

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