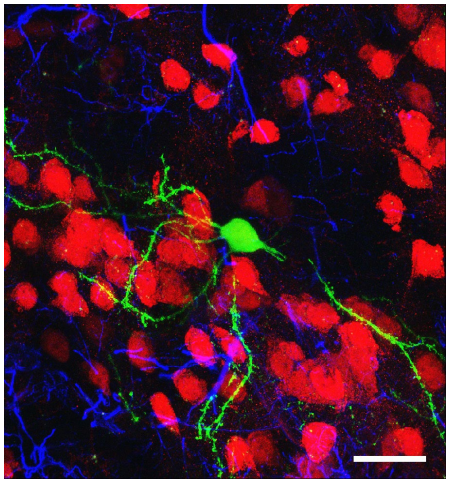

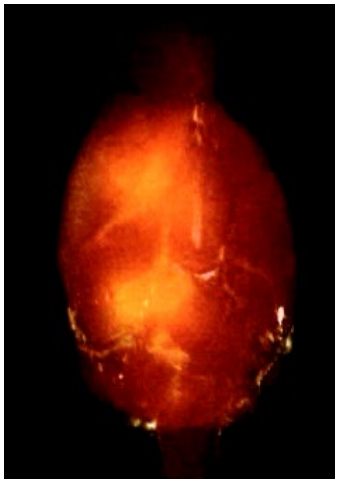

ELISA KONOFAGOU

NONINVASIVE BRAIN DRUG DELIVERY AND MODULATION USING FOCUSED ULTRASOUND

Current treatments of neurological and neurodegenerative diseases are limited due to the lack of a truly non-invasive, transient, and regionally selective brain drug delivery method. The brain is particularly difficult to deliver drugs to because of the blood-brain barrier (BBB). The impermeability of the BBB is due to the tight junctions connecting adjacent endothelial cells and highly regulatory transport systems of the endothelial cell membranes. The main function of the BBB is ion and volume regulation to ensure conditions necessary for proper synaptic and axonal signaling. The BBB prevents most neurologically active drugs from entering the brain and, as a result, has been isolated as the rate-limiting factor in brain drug delivery. Until a solution to the trans-BBB delivery problem is found, treatments of neurological diseases will remain impeded. Over the past decade, methods that combine Focused Ultrasound (FUS) and microbubbles have been shown to offer the unique capability of noninvasively, locally and transiently open the BBB so as to treat central nervous system (CNS) diseases. Four of the main challenges that have been taken on by our group are: 1) assess its safety profile, 2) unveil the mechanism by which the BBB opens and closes, 3) control and predict the opened BBB properties and duration of the opening and 4) assess its potential in neurotherapeutics. Focused ultrasound (FUS) neuromodulation has previously been proposed as a promising technique to drive neuronal activity and has been shown throughout a breadth of applications including in mice, rats, non-human primates and humans as a novel technique for the noninvasive manipulation of neuronal activity using ultrasound. Our group has demonstrated excitation of both the central (CNS) and peripheral nervous system (PNS). In the CNS, motor- and cognitive-related brain regions of mice were induced by targeting specific brain structures. Higher acoustic pressures increased the success rate. Pupil dilation was observed when neuromodulating regions in the brain covering the superior colliculus and other anxiety-related structures such as hippocampus and locus coeruleus. In the PNS, we showed for the first time stimulation of the sciatic nerve with FUS eliciting a physiological motor response was recorded in vivo.

i3M Seminar

Elisa Konofagou

Columbia University

DATE AND PLACE

27.07.2022 at 10:00

Salón de actos, Cubo rojo

and online (Chrome)

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

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